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USSR REPORT: LIFE SCIENCE
BIOMEDICAL AND BEHAVIORAL SCIENCES

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USSR REPORT

LIFE SCIENCES

BIOMEDICAL AND BEHAVIORAL SCIENCES

CONTENTS

AGROTECHNOLOGY

TAJIK SSR CONTRIBUTION TO FULFILLMENT OF USSR FOOD PROGRAM

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 2-6

[Article by V. Vladislavov: "Knowhow Worthy of Being Disseminated"]

[Text] This year, the republics of Central Asia are celebrating their 60th anniversary. There has been a radical change in the life of the people in this formerly backward region of tsarist Russia. Along with other peoples of our multinational homeland, they are successfully building a communist society and hold the most progressive positions according to many indicators of development of industry and agriculture, science and culture. There are very many examples of this, and one of them is development and introduction of the most progressive, integrated protection of plants, which is based on the latest advances in science and progressive knowhow. The article below tells about how this work is being done in one of the Central Asian republics, Tajikistan, and what role it plays in the national economy.

In honor of the glorious anniversary of their republic, the workers in the Tajikistan agroindustrial complex have assumed greater socialist obligations: by intensifying agricultural production to exceed their planned assignments and sell the government 910,000 tons of raw cotton in 1984, including 330,000 tons of fine-fiber varieties, build up grain production, make broader use of obtaining two grain crop harvests in irrigated fields and, as a result of this, bring up gross grain harvest to 320,000 tons. There are plans to produce 262,000 tons of vegetables, 70,000 tons of cucurbits, 105,000 tons of potatoes, 132,000 tons of fruit, 166,000 tons of grapes and 1100 tons of citrus fruit at kolkhozes, sovkhozes and other agricultural enterprises, as well as to reduce production losses during cultivation, harvesting, transportation and storage.

Under difficult weather conditions, thanks to high skill, improved sophistication of agricultural, introduction of progressive technologies, the assignments for 3 years of the 11th Five-Year Plan have been fulfilled with respect to selling raw cotton and other agricultural products to the state. All of the reserves for recovering equivalent harvest from each hectare of land have been utilized. Special significance is attributed to eradication of harvest losses due to pests, diseases and weeds, and to extensive use of integrated plant protection.

The readers of this journal know that this republic was the initiator of development and introduction to agricultural production of integrated protection of cotton plants. The experience gained in Tajikistan has been approved by the Presidium of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin] and board of the USSR Ministry of Agriculture, and it has been recommended for extensive use. Recently, this correspondent visited that republic again and met those who are developing this system and actively introduced it, the specialists in the plant protection service, agronomists and chiefs of farms, scientists, party and soviet workers. We spoke of what integration of methods has achieved, how its different elements are being refined and what problems have to be solved.

Let me remind the reader of the reason it was necessary to change to integrated protection of cotton plants. In 1959-1967, in spite of chemical treatment of cotton, which was performed 10-15 or more times per season at many farms, the number of pests not only failed to diminish, on the contrary, it increased, and there was also increase in harvest loss. As a rule, pesticide spraying was instituted with appearance of cotton shoots, and it was repeated every 5-8 days, without consideration of extent of field involvement and presence of entomophages. All this required serious expenditures, and it also had an adverse effect on the environment.

The new system, which was developed by scientists and production workers, involves, first of all, extensive use of organizational-management and agrotechnical measures, the biological method, procedures that improve plant resistance and, mainly, wise use of chemicals on the basis of thorough inspection of each field, taking into consideration the criteria of number of harmful and useful species, spot use (in foci) of pesticides, alternating them, use primarily of portable and tractor equipment. All this reduces drastically the frequency of chemical treatment, diminishes its adverse effect on the environment and helps establish the necessary conditions for development of parasites and predators.

What has integrated protection of cotton achieved? In Tajikistan, in terms of a single track [?], while 2,048,000 ha were treated with pesticides and there were an average of 8.9 such treatments in 1967, the figures for 1977 were 1,425,000 and 5.4, respectively, for 1978 1,170,000 and 4, for 1979 820,000 and 2.7, in 1983 782,000 and 2.5.

In 1978, integrated cotton protection was introduced to 120 farms over an area of 180,000 ha, in 1979 to 130 on 250,000 ha and in 1983 to all farms on 306,000 ha. According to the estimates of scientists and specialists, this system saves up to 10 q raw cotton per hectare.

The following are among the people who developed and actively introduced the system of integrated protection of cotton: M. N. Narzikulov, Academician of the Tajik Academy of Sciences; G. M. Van'yants, first deputy chairman of the Tadzhiksel'khozkhimiya [Tajik Scientific Production Association for Agrochemical Services to Agriculture]; M. O. Oripov, chief of department of agriculture and food industry of the Leninabad Oblast Committee of the Tajik communist party; V. G. Kovalenko, chief of plant protection department at

the Tajik Scientific Research Institute of Agriculture; M. S. Samadov, chief of the Tajik Republic Quarantine Inspectorate; A. S. Samatov, twice awarded the title of Hero of Socialist Labor and chairman of the Kolkhoz imeni V. I. Lenin in Proletarskiy Rayon of Leninabad Oblast; S. D. Dzhumayev, Hero of Socialist Labor, chairman of the Kolkhoz imeni K. Marx in Kolkhozabadskiy Rayon of Kurgan-Tyube Oblast; D. N. Nabiyev, Hero of Socialist Labor, chief agronomist of the Kolkhoz imeni Urunkhodzhayev in Khodzhentskiy Rayon of Leninabad Oblast, and others.

Last year was a good one for development and reproduction of many species of cotton pests. Severe infestation of plantations with the spider mite was present in farms of Parkharskiy and Moskovskiy rayons of Kulyab Oblast, Kumsangirskiy, Dzhilikulskiy and Yavanskiy rayons of Kurgan-Tyube Oblast, Gissarskiy and Tursunzadevskiy rayons of the Gissar Valley, Matchinskiy and Zafarabadskiy rayons of Leninabad Oblast. Still, there was only spot treatment of the fields, at the sites of infestation, with ground equipment, with consideration of criteria of number of harmful and useful species, and extensive use was made of the system of alternating pesticides. There was 0.3-fold frequency of treatment.

The population of first-generation bollworms was exceptionally large in Kulyab and Kurgan-Tyube oblasts. There were up to 69-150 eggs and 100 caterpillars per 100 plants. Second- and third-generation bollworms were widely distributed in the Gissar Valley and Leninabad Oblast. Both eggs and caterpillars of different ages could be found together on infested plots. Chemical treatment against the bollworm was performed in strict accordance with the results of inspections, with consideration of economic thresholds and mainly using ground-based equipment. Treatment was performed 1.6 times. Concurrently, there was treatment against aphids and spider mites. It is also important to mention the following fact. As a result of thorough and regular inspection of cotton fields, and adherence to economic thresholds, the planned treatment against the spider mite was canceled on 150,000 ha and against the bollworm on 175,000 ha.

As we have already mentioned, in 1983 integrated cotton protection was introduced to all planted fields and all farms in this republic. During the operational season, there were 1300 inspectors at work, more than 1600 tractor sprayers and 7000 portable sprayers were used.

In this republic, there are 565 specialists in plant protection, almost 400 of whom have higher specialized education. There are 1-2 agronomist-entomologists at each cotton-growing farm, with a permanent staff of inspectors (1 per 150-200 ha).

As compared to 1967, 18,000 tons less pesticides were used on cotton plants in 1983, and frequency of treatment was almost 1/5th less. The volume of chemical treatment decreased by 850,000 ha, although in the same period there was 30% increase in cotton plantations. Use of airborne chemical spraying of cotton plants decreased from 1,260,000 ha in 1967 to 110,000 ha in 1983.

The Institute of Zoology and Parasitology of the Tajik Academy of Sciences has identified the composition of predatory and parasitic arthropods that

live on phytophages in the cotton agrobiocenosis, microorganisms that are pathogens for bollworm and turnip moth caterpillars. A study has been made of their useful role in controlling the population size of harmful species. The scientists of this institute, together with the Tajik Scientific Research Institute of Agriculture and Scientific Research Institute of Horticulture, are working on the technology for using sex pheromones of the bollworm and turnip moth, fruit moth and European grape moth. Procedures have been developed for effective use of biological agents. Determination was made of local Trichogramma and Habrobracon species; their biology, ecology and technology of mass reproduction have been studied. The place of the biological method and its role in integrated plant protection have been defined. With each year, increasing attention is being given in this republic to the use of biological agents. While they were used on 56,000 ha in 1981 and 145,000 ha in 1982, the figure for 1983 was 160,000 ha. The biological method has become an important element of integration. There are recommendations on the use of biological agents in each kolkhoz and sovkhoz, and they are being followed well.

In this republic, the biological method also refers to development of necessary conditions for vital functions of naturally occurring entomophages--parasites and predators--and seasonal colonization of entomophages, as well as use of biologicals. The following are among the naturally occurring entomophages and acariphages: egg parasites (Trichogramma), larvae of the green lacewing and Habrobracon, which affect development and population size of bollworms, turnip moths and beet armyworms; Larvaevoridae, leaf beetles and Orius predatory bug, which affect flies; acariphagous thrips, Stetorus beetle, green lacewing larvae and Orius bug, which affect the spider mite; larval and beetle form of ladybugs and green lacewing larvae, which affect aphids.

Studies have shown and practice confirmed that chemical treatment can be omitted against aphids when there are 100-150 entomophages per 100 cotton plants, against spider mites when there are 150-200 entomophages and against bollworms with 200-250 entomophages. With 250-300 entomophages there is no need to use pesticides against all sucking and gnawing pests.

Minimalization of soil treatment and combining several technological operations are instrumental in vital functions of naturally occurring entomophages, since they reduce the number of passes a tractor makes over the field. Pesticides are used only in the sites of pest reproduction. The following criteria prevail: presence of plant infestation with sucking pests scored at 2 points, 10-12 caterpillars of bollworms per 100 cotton plants with medium-size fiber and 3-5 caterpillars for thin-fibered plants, 1 turnip moth caterpillar per square meter and 5% of plants infested with beet armyworms. Preference is given to agents with selective action, such as kelthane, acrex, phosalone, plictran and omite. Sections are singled out for seed alfalfa growing, which attracts a large number of entomophages.

The recommendations for use of biological agents call for combining microbiological agents (dendrobacillin and bitoxybacillin) with release of entomophages and spot use of insectoacaricides.

The broad use of entomophages and biologicals makes it possible to reliably protect harvests with minimal use of chemicals. Let us mention, for example, the Kolkhoz imeni V. I. Lenin in Proletarskiy Rayon, Leninabad Oblast. There, at the instigation of A. S. Samatov, chief of the farm, twice awarded the title

of Hero of Socialist Labor, a laboratory was set up, as far back as 1981, which has now been transformed into a modern biological factory. And here is what it has accomplished. In 1981, Trichogramma and Habrobracon were used on 1000 ha, in 1982 on 11,900 and in 1983 on 17,500 ha (in terms of one-time treatment). In 1984, Habrobracon was used on 4000 ha and Trichogramma on 25,000 ha. The economic efficiency of using the biological method at this kolkhoz constituted 648,000 rubles in 3 years!

Ch. Z. Zununov, first secretary of the Proletarskiy raykom [rayon party committee], stresses that the Kolkhoz imeni V. I. Lenin will provide the entire rayon with biological materials in the very near future. The farm enjoys much authority. On the basis of its achievements last year, it was awarded the Challenge Red Banner of the CPSU Central Committee, USSR Council of Ministers, AUCCTU [All-Union Central Council of Trade Unions] and Komsomol [All-Union Leninist Communist Youth League] Central Committee. Incidentally, the same high award was bestowed upon Leninabad Oblast. Comrade Zununov continues, "We devote much attention to questions of combined use of chemistry on the fields, integrated protection of plants. In our region, this applies to half of the entire harvest."

This is what B. N. Narzyyev, chief agronomist for plant protection at the Kolkhoz imeni V. I. Lenin, has to say: "Last year, we recovered 33.2 q/ha raw cotton from 8500 ha. This achievement was largely due to proper organization of protection work. There is one inspector for each 100 ha of cotton plantation at the kolkhoz; a farm airport and chemicals center have been constructed. While the farm used 340,500 tons pesticides (58.7 rubles/ha) in 1981, the figure for 1982 was 145,800 tons (33.3 rubles/ha). These indicators dropped to one-half in 1983. I should like to mention the great assistance given to me by my immediate superiors--D. Zh. Shukurov, chief agronomist of the kolkhoz (who, incidentally, previously headed the plant protection service at the farm), and V. A. Drannikov, who is the chief of the rayon station."

There are 21,000 ha of cultivated land, including 6000 ha of orchards, in Kanibadamskiy Rayon of Leninabad Oblast. All of the farms, a total of eight, are profitable. Each has a chemicals center and employs agronomist-entomologists (they are also involved in use of fertilizers). Herbicides are applied with portable sprayers on 6000 ha of cotton plantations (which total 10,000 ha). The fields are inspected regularly for infestation; chemical treatment of cotton plants is performed mainly by portable sprayers at infested sites. While this crop was treated 2.5-3 times 2-3 years ago, this was done 1.3 times in 1983. In 1985, a biological factory will go on line. There is a well-performing mechanized detachment for plant protection, which does 45% of all extermination work on cotton plants.

"Let me cite just one example," states B. M. Mansurov, first secretary of the Kanibadamskiy raykom. "In 1983, the Moscow Kolkhoz treated only 65 out of 540 ha of cotton plantations, and the entire crop was preserved."

G. S. Savriddinova, first secretary of the Isfarinskiy raykom, praises highly the role of the biomethod. With her help, a biological laboratory was built in the Kolkhoz imeni V. I. Lenin, where Trichogramma and Habrobracon are bred. Already in the first year, the entomophages were used with success on

1150 ha. Soon Trichogramma, Habrobracon and dendrobacillin will become the main elements in protection of cotton plants. There is still a shortage of special equipment for plant protection in this rayon, and for this reason, S. Yu. Yuldashev, chairman of RAPO (rayon agroindustrial association), is taking steps to have the mechanized detachment of Sel'khozkhimiya (Scientific Production Association for Agrochemical Services to Agriculture] render more active assistance to the farms.

Ye. S. Shakirov, first secretary of the Khodzhentskiy raykom, and D. N. Nabiyev, chief agronomist of the Kolkhoz imeni Urunkhodzhayev and Hero of Socialist Labor, emphasize the potential of integrated protection of cotton plants. At that kolkhoz, where there are more than 2000 ha of cotton, chemical treatment was performed 2.2 times in 1983, whereas previously it was 5 times more frequent. There, cotton and alfalfa crop rotation has been adopted.

We visted the brigade of D. A. Tokhirov, Hero of Socialist Labor and recipient of the USSR State Prize. In honor of the republic's 60th anniversary, he took on the obligation of harvesting 60 q/ha raw cotton over the entire area assigned to his brigade (122 ha). Incidentally, the brigade had been given 51 q/ha last year. And the land there is pebbly. Again, integrated protection is cited as the main element of success. There are plans for the farm to build its own biological laboratory. M. O. Oripov, chief of the department of agriculture and food industry of the Leninabad obkom [oblast party committee], candidate of agricultural sciences and former chief of the oblast plant protection station, told us in detail how the integrated system is being introduced and what it has done for the farms. While the average was 2.5-fold treatment of cotton plants on 90,000 ha under the 10th Five-Year Plan, it was only 1.7-fold in the 3 years of the 11th one! And in the 1960's, the plantations were treated with pesticides 12-15 times per season. Mean harvest increment was 5 q/ha, not to mention the savings in material and technical supplies, as well as solution of problems of environmental protection.

Maruf Oripovich states, "In recent times, we have been giving preference to sulfur agents in the control of spider mites. We found that they also scare off bollworms." F. Z. Karimov, secretary of the Kurgan-Tyube obkom and former chief of the Kumsangirskaya plant protection station, stresses the preventive importance of peripheral treatment of cotton fields against spider mites with sulfur preparations. Prompt institution of such treatment makes it possible to omit treatment of plantations. And cotton is planted in this oblast over an area of 142,000 ha.

"In Kumsangirskiy Rayon of Taldy-Kurgan Oblast, integrated protection of cotton started to be practiced in 1973, and it was soon used in all of the farms," says M. B. Babayev, chairman of RAPO. "In 1981 there was 2-fold treatment, in 1982 1.7-fold and in 1983 1.5-fold! We plan to expand the use of biologicals. We shall build biological laboratories at all of the cotton farms by the end of the current five-year plan." A. P. Pulatov, chief agronomist of the Kolkhoz imeni Zhdanov, continues the conversation: "And we shall be the first. We raise cotton on 2600 ha and the harvest is stable, 32-34 q/ha. Integrated protection saves 6-7 q/ha for us. Last year, 1.2 treatments were performed."

A. N. Maksumov, deputy chairman of the Tajik Council of Ministers, believes that the integrated system helped solve the problem of protecting cotton plants.

"There have been years," Akbar Nusratullayevich says, "when some farms performed up to 20 chemical treatments, yet harvest losses remained high. There were 25-30 bollworm caterpillars on the bushes, and they were removed by hand. Now this is a thing of the past. But we must be on the alert, constantly upgrade different elements of the system, replacing them with new, more modern ones. This also applies to alternation of pesticides to prevent appearance of resistant forms of pests, and use of microbiologicals and entomophages. The scientists of this republic must combine their efforts to solve key problems of plant protection. It is high time to establish a branch of the Central Asian Institute for Plant Protection in Tajikistan."

The experience gained in Tajikistan indicates that one can reduce the use of chemicals drastically without detriment to harvest, as well as prevent formation of resistant populations and, not only preserve useful entomofauna, but enhance its activity, prevent flare-ups of pest reproduction, improve sanitary and hygienic conditions when working on the fields, solve the problem of environmental protection. This knowhow cannot fail to be considered when developing systems of integrated plant protection in other parts of the country.

PHOTO CAPTIONS

p 2 G. M. Van'yants, first deputy chairman of Tadzhiksel'khozkhimiya Association

p 3 Top, left: M. O. Oripov, chief of department of agriculture and food industry, Leninabad obkom, candidate of agricultural sciences

Top, center: M. S. Samadov, chief of Tajik Inspectorate for Plant Quarantine, Honored Agronomist of Tajik SSR

Top, right: I. G. Ishankulov, chief of Tadzhiksel'khozkhimiya Plant Protection Administration

Bottom: A. S. Samatov, chairman of Kolkhoz imeni V. I. Lenin, Proletarskiy Rayon, Leninabad Oblast, twice awarded title of Hero of Socialist Labor

p 4 Kh. A. Alimov, first deputy chairman of Kolkhoz imeni V. I. Lenin, Ch. Z. Zununov, first secretary of Proletarskiy raykom, D. Zh. Shukurov, chief agronomist of this kolkhoz and K. S. Saliyev, head of biological laboratory

p 5 Top: F. Z. Karimov, secretary of Kurgan-Tyube obkom, Kh. V. Vakhabzhanov, chairman of Oblast Sel'khozkhimiya Association and Yu. N. Posilyanov, first secretary of Yavanskiy raykom

Bottom: M. B. Babayev, chairman of Kumsangirskiy RAPO, S. N. Alimukhamedov, corresponding member of All-Union Academy of Agricultural Sciences imeni Lenin, and A. P. Pulatov, chief Agronomist of Kolkhoz imeni Zhdanov

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BIOLOGICAL METHOD--AN IMPORTANT ELEMENT OF INTEGRATED PROTECTION OF COTTON

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 6-7

[Article by A. Sh. Shamuratov, chief of economic sector, SANIIZR (Central Asian Scientific Research Institute of Plant Protection), A. M. Kalmuratov, chief of the Chimkent Plant Protection Station, and T. S. Suyunbayev, chief of the Osh Plant Protection Station]

[Text] In recent times, measures for control of pests, diseases and weeds in cotton plantation are performed annually on 10-12 million hectares. The share for Uzbekistan, which is the main cotton-growing republic, is 60% of protective work, that of Azerbaijan is 17%, Tajikistan 8%, Kazakhstan 7%, Kirghizia 5% and Turkmenia 3%.

Gross cotton harvest in 1980-1982 constituted an average for the country of 10 million tons/year, and 62.5% of its procurement and delivery to the state is referable to Uzbekistan, 12% to Turkmenia, 10.5% to Azerbaijan, 9.6% to Tajikistan, 3.6% to Kazakhstan and 1.8% to Kirghizia. Specialists in plant protection merit considerable credit in obtaining the large harvests, since the system of special measures used in cotton crop rotation prevents annually 15-20% of the potential loss of cotton yield. It has been determined that integrated protection in the cotton-growing republics of Central Asia and South Kazakhstan saves an average of 4-5 q/ha of raw cotton, while each ruble spent yields 6-10 rubles income.

Here, the chemical method plays a major role in the control of a set of pathogens. For example, in Uzbek SSR, pesticides were used on 6.5 million hectares in 1982 to control pests of cotton plants, alfalfa, vegetables and cucurbits, orchards, vineyards and grasshoppers, and on 5.8 million ha in 1983, including 4.7 million ha cotton in 1982 and 4 million ha in 1983.

It must be stated that, on the example of volume of chemical treatment in 1982 and 1983, it is easy to detect the general trend in protection of cotton: the scope of its use is diminishing. This is due, primarily to decrease in frequency of using pesticides (from 3-4 treatments to 2) and introduction of the biological method.

In late 1983, there were 637 biological laboratories and factories operating in Uzbekistan, in which work was done to raise Trichogramma and Habrobracon

for protection of crops in the cotton crop rotation against the principal pests.

In general, last year was outstanding in this republic, as compared to all prior years, in extent of use of the biological method: in 1983, the cotton fields and concomitant crop rotation area protected by this method increased by 10 times, as compared to 1976, and constituted more than 4.4 million ha.

The Politotdel Kolkhoz of Kommunisticheskiy Rayon in Tashkent Oblast was one of the first farms in Uzbek SSR, where bioprotection of cotton plants was begun. There, a mechanized automated line was installed in 1976 for breeding Trichogramma. The produced biological material made it possible that same year to protect crops with virtually only one chemical spraying against sucking pests. Before this, 4-5 pesticide treatments had been performed per year at the same farm. There was annual increase in use of the biological method at the kolkhoz, while use of chemical agents diminished. No highly or moderately toxic insecticides are used there at all against the bollworm, turnip and other moths on cotton plants and vegetable crops. Only Trichogramma, Habrobracon, dendrobacillin and, if necessary, the least toxic pesticides are used to control these pests.

M. G. Khvan, chairman of the kolkhoz, has made a large contribution to the introduction of the biological method on cotton. In 1983, the USSR Council of Ministers Prize was bestowed upon him for this work. P. A. Lim, chief of the kolkhoz biological laboratory, also devotes much effort to his beloved work.

Extensive use of integrated protection of cotton at the Politotdel Kolkhoz made it possible to reduce chemical spraying against pests to less than 1/6th in 1975-1982, decreasing frequency of treatments from 4.5 to 0.75 times. In the same period, there was gradual reduction of expenses for chemical treatment, cotton yield has increased and so has the cost of raw cotton delivered to the state as a result of improvement of its quality. There has also been a reduction in share of expenses for pesticides in the structure of cotton cost; income and savings have increased for agents, as well as profitability of the protective measures.

An analogous trend is observed in all of the leading cotton-growing farms of Central Asia and South Kazakhstan, where the biological method is being wisely organized and introduced in integrated protection of cotton crop-rotation fields.

For example, in Chimkent Oblast of Kazakh SSR, where the scope of biological protection has grown in 10 years from 150 ha to 116,400 ha, many farms have achieved high indicators. Thus, in 1982, 34.5 q/ha raw cotton was harvested at the 30 Years of October Kolkhoz in Kirovskiy Rayon, where the plan called for 32.8 q/ha, 37.2 q/ha was raised, versus the planned 34.6 q/ha, on 1000 ha in the Algabas Kolkhoz in Pakhtaaral'skiy Rayon.

Use of Trichogramma in Osh Oblast of Kirghiz SSR is yielding high results, and increasing use is being made there of this entomophage from year to year. Thus, while it was used to treat 8900 ha in 1979, the figures were 42,900 ha

for 1980, whereas the average was 70,000 in 1982 and 1983. In 1982-1983, there were 37 kolkhoz, 2 interfarm and 1 oblast biological laboratories operating in the oblast.

As we see, introduction of the biological method to integrated protection of cotton in republics of Central Asia and Kazakhstan has justified itself. For this progressive direction to gain an even more solid position there is still much to be done. The established tasks must be performed concerning development of a network of biological factories and laboratories; we must achieve high output and quality of produced biological material. Mechanized release of Trichogramma, improved technology of breeding Habrobracon, refinement of procedures for using biologicals, etc., are called upon to play a major role in development of biological protection of cotton plants.

Conference of Virologists

In June, there was an All-Union conference at the Institute of Botany, Lithuanian Academy of Sciences, on the topic of "Theory and Practice of Using Cultivar Immunity to Viral Diseases." It was attended by specialists from the All-Union Institute of Plant Protection, Moscow State University, Scientific Research Institute of Potato Growing, Belorussian Scientific Research Institute of Plant Protection and other institutes.

There was discussion at this conference of general questions of cultivar immunity to viral diseases, as well as virosis of potatoes, grain and certain other crops.

PHOTO CAPTION

p 7 In Proletarskiy Rayon of Leninabad Oblast, much attention is given to introduction and refinement of integrated protection of cotton plants. There are agronomist-entomologists, inspectors and specialized brigades in each farm. At the Kolkhoz imeni V. I. Lenin, a biological factory went on line recently for production of Trichogramma. It will be used in all farms of this rayon. RAPO and the Sel'khozkhimiya association are concentrating on problems of plant protection.

The photo shows A. Sh. Shukurov, chairman of the Proletarskiy RAPO, and S. B. Bakiyev, chairman of Sel'khozkhimiya.

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PRESSING TASKS FOR SCIENTISTS AND PRODUCTION WORKERS

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 15-17

[Article by Yu. N. Fadeyev, academician of the All-Union Academy of Agricultural Sciences imeni Lenin, L. A. Gus'kova, chief of laboratory at the All-Union Institute of Plant Protection, and O. Z. Metlitskiy, group leader at the Zonal Scientific Research Institute of Horticulture of the Nonchernozem Belt]

[Text] Intensification of agriculture is leading to a drastic increase in deleteriousness of nematodes, which are plant parasites. Worldwide production loss due to them is estimated at 7-10%, and in some cases it reaches considerably higher figures. In our country, the oat eelworm inflicts quite perceptible damage to grain growing in eastern regions, the golden Globodera damages potato crops in western regions, while the tuber eelworm is damaging in many other regions. Gallworms strike vegetable crops in the south and in protected soil, and stem eelworms are a bane in the main areas of raising clover, onions and strawberries. Toxicosis of farm animals is quite dangerous as a result of infestation of fodder grass with nematodes--Strongyloides and corynebacteria. Nematodes transmit numerous viral and fungal diseases of plants, and they lower the efficacy of fertilizers and irrigation.

Because of the concealed lifestyle of phytonematodes, their microscopic size, difficulty of species identification, it is usually difficult to diagnose nonspecific symptoms (in cases when the parasite attacks underground plant organs) of diseases that they cause. Nematodes are extremely resistant to adverse environmental conditions (for example, they can withstand drought for tens of years, 3-10 times higher doses of pesticides are needed to destroy them than for most insects and mites). These pathogens are harmful only when they are present in large enough number in the soil or on plants (on the order of 5000-15,000/g buds or roots, or 100,000 per bulb).

The rate of nematode reproduction and capacity for active migration in soil are considerably lower than in other harmful organisms. This makes it possible to predict harvest loss due to them by measuring the presowing (preplanting) size of their populations in the period between vegetations. Empirical thresholds of deleteriousness have been established for the beet, alfalfa and potato cyst-forming eelworms, some species and races of Meloidogyne and Ditylenchus (VIZR [All-Union Institute of Plant Protection], Kirghiz Scientific

Research Institute of Agriculture, BelNIIZR [Belorussian Scientific Research Institute of Plant Protection, NIZISNP [Zonal Scientific Research Institute of Horticulture of the Nonchernozem Belt], Institute of Zoology and Parasitology of the Tajik Academy of Sciences).

It is extremely important to pinpoint the areas of distribution of nematodes on farm crops. Work to detect them and establish population sizes is being pursued in our country in Estonia, Tajikistan, Karelia, Moldavia, several parts of the RSFSR and Ukraine, where specialsts in the system of the USSR Academy of Sciences are collaborating with agricultural sector institutes, quarantine and plant protection services. In Estonia, in particular, that republic's plant protection station regularly undertakes mass inspections of all areas for infestation with the potato eelworm, Globodera. In Tajikistan, the Institute of Zoology and Parasitology, Tajik Academy of Sciences, is keeping extensive records of Meloidogyne on tomato plantations in order to organize their integrated control. At the kolkhozes and sovkhozes of Amur Oblast, the specialists of the Blagoveshchensk Agricultural Institute are studying the soybean Heterodera. Mass inspections of grain crops, chiefly in the RSFSR, for the oat eelworm were organized by the All-Union Institute of Helminthology. Aerial photography is being used with success for detection of infested sites. At the present time, the phytohelminthological laboratories opened in the Rossel'khozkhimiya [Russian Scientific Production Association for Agrochemical Services to Agriculture] Association are joining them in work for detection of nematodes on farm crops and their control.

Nematodes are encountered in microsites along the horizontal and vertical profiles of soil, and occasionally in plant organs; their species and stages differ drastically in activity. For this reason, work for detection of such sites is technically quite difficult. Several Soviet institutions (NIZISNP, VIZR, VNIITKiZR [All-Union Scientific Research Institute of Technology of Feed Production and Plant Protection]) are upgrading methods for keeping quantitative records of these organisms and making maps of fields; prototypes have been built of high-power equipment (Kaluga Inspectorate for Plant Quarantine, Potato Scientific Production Association of the RSFSR Ministry of Agriculture, VNIIZR [All-Union Institute of Plant Protection], BelNIIZR, VNIITKiZR, SibNIIZKhim [Siberian Scientific Research Institute of Chemical Protection?]) for detection of nematodes and so have mobile nematodological field laboratories. However, all this equipment exists in very small number and is not produced by Soviet industry. There is an acute shortage of small-mesh (up to 10-15 μm mesh size) strainers.

There has been more than 15-fold increase in number of described species of phytoparasitic nematodes in the last 25 years, and it continues to grow each year. Increasing use is being made of transmitting and scanning electron microscopy (for example, at the Scientific Research Institute of the Karelian Affiliate of the USSR Academy of Sciences and at the SibNIIZKhim) for identification of this group of pathogens. Only highly qualified, specialized taxonomists are able to make an exact identification of the different groups.

Unfortunately, qualified taxonomists often record only the qualitative composition of populations in their faunistic studies using nonquantitative,

selective methods of collecting samples and isolating nematodes from them. As a result, the false impression is created that there is prevalence of the most easily detectable nonparasitic species. In some cases, the recorded fauna is tied in to a set of crops in an oblast or republic, without indicating the specific species of plants, locality and differences in soil. Probably, most of the specialists in the system of the USSR Academy of Sciences and universities should proceed in the direction of quantitative studies and, primarily, of parasitic species. In our opinion, the wisest approach would be for them to cooperate with specialists in agricultural sector institutes and phytohelminthological laboratories, who could furnish them with sorted specimens. This would advance to a higher level the work of the Soviet school of phytonematode taxonomists, the achievements of which and, in particular of its leaders, professors I. N. Filip'yev, A. A. Paramonov, Ye. S. Kir'yanova, T. S. Skarbilovich, A. T. Tulaganov and a number of their disciples, have merited worldwide recognition. Publication of an entire series of guides for the most important groups of phytoparasitic nematodes was very important to the development of systematics; it was organized in the 1970's by the Zoological Institute, USSR Academy of Sciences (under the supervision of Ye. S. Kir'yanova). In recent years, this work was continued by the Helminthological Laboratory of the USSR Academy of Sciences. It is imperative to intensify this extremely important work, particularly with respect to preparing guides of gallworms, cyst-forming nematodes, Strongyloides and Pratylenchus.

Knowledgeable control of nematodes requires not only exact identification of species but, in a number of cases, investigation of race status, genetics, physiology, biochemistry and morphology of their interaction with host plants on different levels (including the molecular). Without this, it would be impossible either to breed cultivars resistant to them or plan nematode-controlling crop rotations, or to search for new means of treating plant nematodiasis. At the present time, intensive studies are in progress in our country of races of the potato Globodera (VNIITKiZR, BelNIIZR, VIZR, VIGIS [All-Union Institute of Helminthology imeni Academician K. I. Skryabin]); the species and race composition has been defined for cyst-forming nematodes; in addition to the oat eelworm, several other genera of heteroderids have been discovered on grain crops, including a species new to science, Bidera filipjevi (VIGIS, VNIIZR, VIZR, IZIP [Institute of Zoology and Parasitology] of the Tajik Academy of Sciences); similar studies have been started of the soybean and gall eelworms (Blagoveshchensk Agricultural Institute, VIGIS, IZIP Tajik Academy of Sciences, Institute of Experimental Zoology and Physiology, Moldavian Academy of Sciences). The work of the Scientific Research Institute of Biology at Kharkov University dealing with comparative ecology, genetics and cytogenetics of races of stem eelworms is extremely interesting. It is necessary to expand studies of geographic variability of species referable to the above-mentioned groups, to form banks of standard nematode cultures on the basis of cultivation of plant callus and apices, so as to furnish them to breeding centers. Relevant methodological work has already been done at VIGIS, GELAN [Helminthology Laboratory of USSR Academy of Sciences] and Institute of Zoology, Lithuanian Academy of Sciences. For the same purposes, it is necessary to accelerate reproduction of assortments of plants introduced by VIZR and VIR [All-Union Scientific Research Institute of Plant Growing]--international differentiaters of races of cyst-producing and gall eelworms.

In the past, the work done at GELAN and the Scientific Research Institute of Biology of Kharkov University initiated intensive investigation of pathological changes associated with nematode diseases of plants, influence on pathogenesis of hydrolytic and oxidative enzymes. At the present time, such studies are being pursued also at the Institute of Experimental Zoology and Physiology of the Moldavian Academy of Sciences and Institute of Zoology and Botany of the Estonian Academy of Sciences. It is growing increasingly apparent that there is active protection of plants against nematodes, similar to that observed with regard to fungal and bacterial infections. In order to investigate these matters, broader use should be made of the achievements of our mycologists--phytopathologists and biochemists.

The use of resistant cultivars is of exceptional promise in the control of nematodes. In our country, 10 varieties of potatoes have been developed, which are not susceptible to the golden potato Globodera. Several more promising potato hybrids have also been handed over to the State Commission for Cultivar Testing. However, there is still much to do to supply sovkhozes, kolkhozes and private plots with potato cultivars that are resistant to Globodera. At the present time, donors of combined resistance to Globodera, bud eelworms and several other pathogens have been discovered among wild potato species. This work was done at the VIR and its network, BelNIIZR, Potato Scientific Production Association, Kaluga Breeding Station, Latvian Scientific Research Institute of Agriculture and Agricultural Economics. In our opinion, evaluation for nematode resistance should become mandatory for potato cultivars zoned in the European part of the USSR.

Grain crop hybrids have been developed that are resistant to oat eelworms (SibNIIZKhim, VNIIZR, VIGIS), clover that is insusceptible to stem eelworms (All-Union Scientific Research Institute of Feed, Latvian Scientific Research Institute of Agriculture and Agricultural Economics), tomatoes and cucumbers that are resistant to gallworms (Moldavian Scientific Research Institute of Irrigated Agriculture and Vegetable Growing, Scientific Research Institute of Vegetable Growing, VIGIS, IZIP Tajik Academy of Sciences), as well as rice that is resistant to rice Aphelenchoid. Cultivation of these varieties combined with use of nematocides or crop rotation results in significant removal from soil of the above pathogens.

It is necessary to expand significantly breeding for nematode-resistance of cotton, alfalfa, soybeans, sugar beets and grapes. Of course, methods of evaluating plants for insusceptibility should be standardized so that this work could be performed on the needed scale.

At the present time, problems of quarantine and preventive measures are also advancing to the fore. Studies in this area are being pursued by VNIITKiZR and sectorial institutes that produce superelite seed and planting material. And special attention must be given here to breeding collections, varietal testing plots and seed-growing farms which are usually the primary source of migration of nematodes to new regions. Broader introduction is needed there of measures to restrict migration of these pathogens to new areas with farm equipment, transport, irrigation and rain water, as well as wind. It is high time to expand the list of nematode species to be quarantined, prepare a list of particularly hazardous nematodes that must be eliminated from seed and planting material.

At seed-growing and nursery farms, in quarantine practice and with highly profitable cultivars, one should use first of all the most radical chemical method of controlling nematodes, which also destroys other pathogens. At the present time, such agents are used on crops used as food to protect plants during the most sensitive phases of development, rather than for maximum depression of nematodes, which results in substantial reduction of amounts of these agents used and attenuates their adverse effect on the environment.

At the present time, several experimental institutions, under the supervision of VIZR and the State Commission for Chemical Control of Pests, Plant Diseases and Weeds, have developed economical and ecologically harmless technologies for using nematocides in potato-, beet-, vegetable-growing, in fruit and berry nurseries and viticulture. In addition to highly effective agents that depress a wide assortment of pathogens, which are phytotoxic and for this reason are used before planting in the form of soil fumigants, the use of nonphytotoxic granulated systemic nematocides--insectoacaricides--is acquiring increasing importance. The latter are particularly promising for regions with cool continental climate, where it is not always feasible to apply fumigants.

However, the domestic assortment of nematocides is extremely small. For over 10 years, production has not been resumed in our country of the highly effective and ecologically safe fumigant, carbathion. DD and DDB are produced with a very low active ingredient content. Such a high price has been set for thiazon (2000 rubles/ton), that it cannot be profitable when used in the recommended doses. Systemic nematocides are not being produced or supplied to agriculture. The lack of machinery to apply nematocides in the soil also prevents use of those produced by industry, although we know of several simple attachments that would permit use of domestic series-produced fan sprayers and primer sprayers of general purpose fumigators for hop fields and vineyards (Kaluga State Inspectorate for Plant Quarantine, Potato Scientific Production Association, Ukrainian Scientific Research Institute of Viticulture and Viniculture).

Crop rotation is a tried agroprocedure, which lowers the harm of nematodes. In our country, effective systems of crop rotation have been proposed and are being introduced on large areas for control of oat (VIGIS), soybean (Blagoveshchensk Agricultural Institute) and bud nematodes (Potato Scientific Production Association, BelNIIZR), potato Globodera (BelNIIZR), sugar beet nematodes (All-Union Scientific Research Institute of Beet Growing), Meloidogyne in open ground (IZIP Tajik Academy of Sciences, Institute of Experimental Zoology and Physiology, Moldavian Academy of Sciences, Tashkent University). However, one cannot rule out the possibility of rapid selection of races of these organisms capable of reproducing on previously insusceptible crops and the danger of intensification of reproduction of other deleterious nematodes. In addition, one should not overlook the fact that, without thorough destruction of weeds, which are the hosts for these groups of pathogens, any crop rotation is meaningless. It is of basic importance to assess the effect on them of all technological procedures used in raising crops (time and methods of sowing and harvesting, use of herbicides, phytohormones, mineral and organic fertilizers and soil-improving agents, irrigation, etc.).

Under conditions of intensive agriculture, it is also possible to use short-term crop rations and monocrops. In several countries of West Europe, for example, in spite of mass distribution of Globodera, the area planted with potatoes was reduced by 17-35% in the 1970's. There was retention of the former level of gross production. This fact was related to accumulation in soil of the natural enemies of nematodes (mainly fungi that are endoparasites of eggs, cysts and females), which prompted research on the biological method of controlling nematodes.

Encouraging results have been obtained in recent years in controlling nematodes by means of biological agents. Thus, in France, as a result of many years of comprehensive breeding, commercial preparations were developed of nematophagous fungi for control of these pathogens in mushroom composts, for control of gall eelworms in protected ground, as well as control of cyst-forming and stem eelworms in open ground. Use of the bacterium, Bacillus penetrans (closely related to the entomopathogenic bacterium, B. thuringiensis), which is a parasite of gall and several other eelworms, is of particular interest. Its preparations can be recovered by drying tomato plant roots infested with gall eelworms and infected with this bacterium. It is imperative to intensify development of the biological method of control in our country also.

Better coordinated programs of scientific research at institutes in the systems of the USSR Academy of Sciences and All-Union Academy of Agricultural Sciences imeni Lenin in all of the above-mentioned directions is necessary to develop nematological investigations under the 12th Five-Year Plan.

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BIOCENOTIC ROLE OF AGROTECHNICAL PROCEDURES

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 25-26

[Article by V. N. Pisarenko, laboratory head at All-Union Scientific Research Institute of Corn Growing]

[Text] Agrotechnical procedures for protecting grain crops, which combine in the optimum way the requirements of protecting plants and the environment as related to the life form of the pest that they primarily affect, should be divided, in our opinion, into three categories: those aimed at restricting the number of dormant and imago stages, worsening of conditions for development of early stages of harmful organisms and lowering their number at the larval stage. Providing more favorable conditions to activate naturally occurring entomophages is one of the factors of phytosanitary efficacy of these agrotechnical measures.

The results of experiments that we performed in 1972-1982 at the experimental farm of the All-Union Scientific Research Institute of Corn Growing, at the Erastovskaya Experimental Station of that institute and several farms in the steppe zone of the Ukraine, which confirmed the expounded theses, will be included in the integrated systems for protection of corn and winter wheat currently under development.

Procedures Aimed at Limiting Number of Dormant and Imago Stages of Pests

One can curb the migration of the beet webworm within the limits of an agrobiocenosis by eradicating caterpillars at the sites of the winter diapause. Early spring loosening of the soil, which we tested on perennial grass fields using a BIG-3 needle harrow, destroyed 83-93% of the pests. This was due to both mechanical destruction of cocoons with hibernating caterpillars and facilitating access of entomophages to them (dynamic density of their populations increased from 4 to 8.6 specimens per trap per day).

Our model experiments established that when access is facilitated for the Pterostichus cupreus beetle (four specimens/m^2), webworm cocoon death rate reached 7-8/day (in unloosened soil, there was virtually no destruction of cocoons).

An artificial concentration of click beetles, by increasing lumpiness of soil with early spring application of half-decomposed manure (5 tons/ha) on peripheral strips of winter wheat fields bordering on row crops, resulted in significant death of these pests during the period of their migration, mating and deposition of eggs. Establishment of such phytosanitary barriers helps accumulate click beetles in them during the migratory period, and it attracts predatory insects in the top layer of soil. Thus, the number of click beetle imagoes in the bait belts, particularly in years of drought (1979) reached 12.3/m^2, versus 3.6 in the control. Predatory Pterostichus also accumulated under lumps of manure, up to 14.6 specimens (2.4 in the control). The concentration of both organisms was instrumental in increasing the activity of predators.

In some plots, the concentration of pests makes it possible to plan in advance their intensive destruction by means of postharvesting agrotechnical procedures. We refer, first of all, to stripping stubble in 2-3 tracks, which restricts the number of early stages of the pest. In the third year of experiments started in 1977, there were 3.3 specimens/m^2 in plots with stripped stubble and 9.8 without stripping. After stripping in 1978, there were 2.2/m^2 wireworms and without stripping 8.3 in 1980; in 1981, the figures were 1.3 and 4.5/m^2, respectively.

Procedures to Worsen Conditions for Development of First Stages of Harmful Insects

In this republic's steppe zone, in the top layer of soil there is formation of the most favorable correlations, in the biocenotic respect, in the predator-prey system throughout virtually the entire period of plant vegetation. This is conclusively evident on the example of sowing time, number of grain flies and their entomophages. Thus, the number of eggs deposited by female flies in lysimeters on winter wheat fields dropped from 1780 when sowing was done on 15 August to 216 when this was done on 15 September. A record of the number of eggs there (where access of predators of the superficial ground layer was precluded) made it possible to demonstrate the rather high efficacy of entomophages outside the lysimeters, about 94% of the eggs perished.

With optimum sowing time for the northern steppe of the Ukraine (1 to 10 September), there was minimal invasion of plants, since the number of pest eggs deposited was drastically reduced, while the number of entomophages remained virtually unchanged.

As a rule, in large tracts winter wheat is sown at the optimum and optimum allowable times, as a result of which invasion of plants did not exceed, for example in 1976-1981, 12-16%.

Thus, with the present level of energy supply to farms, it is quite feasible to deliberately vary the sowing time for winter wheat, as a means of enhancing the efficacy of naturally occurring populations of entomophages.

An analogous situation develops when sowing time for corn is changed in order to reduce its infestation with frit flies.

With the biocenotic approach, it is necessary to take into consideration the specifics of formation of the fauna in close relationship to the life cycles of species, and this requires some influence on the part of prior crops on development of useful and harmful organisms over a period of several years of sowing grain crops. For example, the biocenotic role of perennial grasses in steppe agrobiocenoses is interesting. They are one of the favorite habitats for click beetles in a crop rotation, by virtue of formed ecological conditions (absence of deep loosening of soil on the fields for 2-3 years, milder microclimate in the stand of grass). The species composition of entomofauna of these tracts on irrigated land is more significant.

The situation is even more complicated for corn fields. In soil-protected crop rotations on dry and particularly irrigated soil, after growing winter wheat for 1-2 years, which follows perennial grasses, corn is planted and maximum harm of click beetle larvae that accumulated on alfalfa and developed for 3-4 years is manifested expressly on corn. Thus, in 1976-1980, an average of $4.3/m^2$ wireworms were found in fields where alfalfa had been grown 5-6 years previously, and 7.2 were found on tracts where it had been raised 2-3 years before.

Since eggs and first-year larvae are the most vulnerable stages of the life cycle of click beetles, it is desirable to take action expressly against them. In order to diminish the adverse biocenotic effect of perennial grasses on corn, one should use methods of destroying click beetles during the period of formation of their foci. Studies have shown that their number can be reduced substantially by loosening the soil with a BIG-3 needle harrow after the first and second cutting of alfalfa for green fodder or harvesting for seeds after the first mowing, which coincides essentially with the period of migration and deposition of eggs by the most prominent speices of click beetles. Such soil treatment has different effects on pest populations in years that differ in precipitation. The greatest decline in number of larvae is noted in dry years. Thus, in 1979 (moisture coefficient 0.3), the number of 3-year wireworms diminished by 79% in our experiments, versus 65-71% in more favorable years (1976, 1977, 1978). The ecological essence of the procedure consists of activation of insects in the top layer of soil (mainly egg parasites of the genus Bembidion), the number of which increases by 3-4 times.

Egg parasites in the order Hymenoptera are a rather useful group of entomophages. Their activity enhances the proper structure of sowing areas and other procedures that provide these insects with food and places of concentration. One of them is strip growing of crops in soil-protected crop rotations on sloped terrain. With strip growing of crops, there is 2-3.5-fold more invasion by parasites of eggs of the chinch bug on winter wheat and of the European corn-borer on corn.

Procedures for Lowering Number of Pests at Larval Stage

At the present time, there are real opportunities for increasing the activity of entomophages referable to the larval stages of pests. Stubble stripping is a procedure that increases their number. Early stripping, for example, creates beneficial conditions for reproduction of one of the predators of larvae of wheat thrips, the "malashka" [?] beetle. Thus, in our studies,

we found up to 317 specimens of this predator on the 21st day after treatment on a stripped plot of unirrigated land and up to 384 on the 28th day, versus 15 and 17, respectively, in the control (without stripping). Accordingly, the number of thrips larvae dropped from 3317 to 736/m^2. In plots where the stubble was stripped, the dynamic density of predatory beetle population was also higher: up to 16-18 specimens were caught per day per trap, versus 6-7 in control plots.

The phytosanitary efficacy of stubble stripping can be significantly improved by using nitrogen fertilizers before stripping. This also increases microbiological activity of soil. Intensification of decomposition of postharvest plant residue could lower significantly the number of pests. As shown by our studies, in the version where ammonium nitrate was applied with disking (2 q/ha) 33% less stem sawflies appeared and 39% less thrips. Rapid decomposition of plant residue in such areas prematurely deprives part of the pest populations of a shelter, and the insects are more susceptible to environmental factors, and first of all entomophages.

Grinding postharvest residues is an important measure that is an organic part of the technology of corn growing. Part of the caterpillars of the European cornborer in the corn stumps perish as a result of both mechanical injury and easier access of predatory insects. The disking recommended for grinding is considerably inferior, in the phytosanitary respect, to the rototiller treatment we tested. Even with two-fold disking, 47% of the hibernating caterpillars perish, whereas with one use of the rototiller 92% are destroyed.

We observed an increase in activity of predators in the top layer of soil when there was damage to the habitats of hybernating cornborer caterpillars in an experiment where we added the destroyed postharvesting corn residue with the pest to containers with beetles. In 3 days, 13% of the caterpillars in whole corn stalks perished with the same number of entomophages (2/m^2), whereas up to 63% of the pests were destroyed in stems that had fissures, into which the predators could penetrate.

We also found that strip planting played an active role on sloped terrain. The floristic diversity over a small territory creates beneficial conditions for existence of useful insects on winter wheat. Thus, according to our observations, infestation of green bug larvae with Aphidiidae reached 77% versus only 31% in a crop-rotation field, and infestation of stem sawflies with parasites constituted 22 and 12%, respectively.

In conclusion, let us indicate that the effect of agrotechnical procedures on vital functions of harmful insects is based on the level of inconsistency between the ecological conditions that man creates to the requirements of ecological optimum for a given form of life or species. The depth and extent of responses of organisms are determined by the dissimilar extent of their adaptive reactions. For this reason, the agrotechnical measures that cause death of early stages of pests, which are ecologically the least flexible, have a particular effect on vital functions of insects. Procedures that affect the most productive dormant imago stages are also very important. Those that worsen larval developmental conditions are less effective in their influence on a given generation of pests, but since they reduce the number of the most harmful stages, which are the "base material" for the next generations, their significance is also great.

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REGULATION OF NUMBER OF PESTS

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[Article by N. Ya. Yevdokimov, department head at the Kazakh Scientific Research Institute of Plant Protection, and A. A. Korchagin, senior scientific associate]

[Text] The USSR Food Program calls for mean annual gross grain harvest in Kazakhstan to constitute 28-29 million tons under the 11th Five-Year Plan and 30.5-31.5 million tons under the 12th one. Protection of grain crops against harmful insects is one of the important ways to increase their yield.

Studies pursued for many years by the Kazakh Scientific Research Institute of Plant Protection in the steppe and forest-steppe zones of Kokchetav Oblast (Chervonnyy and Ruzayevskiy sovkhozes, Stepnoishimskiy and Ruzayevskiy experimental stations) and steppe zone of Turgay Oblast (Dal'niy Sovkhoz, Turgay Experimental Station) made it possible to assess the influence of the principal elements in the soil-protective system of agriculture on harmful and useful fauna. It was established that several agrotechnical procedures lower the number of some pests to less than the economic threshold and limit significantly the use of chemicals.

Studies have shown that grain crops in the above-indicated region are attacked by 71 species of insects and one species of mites. However, perceptible damage is caused only by the gray rustic moth, barley flea beetle, wheat thrips, grain bugs, cereal crop aphids,[or green bugs?], stem-hiding [skrytnosteblevyye?] pests, nongregarious locusts and wheat flower mite. Use of the soil-protective system of agriculture, recommended by the All-Union Scientific Research Institute of Grain Farming in farms of North Kazakhstan reduces the number and harmfulness of the gray rustic moth and barley flea beetle, but enhances reproduction of some sucking and stem-hiding pests, as well as locusts.

The gray rustic moth is the most dangerous pest of spring wheat in the main grain-growing regions of North Kazakhstan. During years of mass reproduction on areas of considerable size, chemical treatment has to be used against it, otherwise grain harvest losses could reach 2-4 q/ha.

Previously, when the terracing system was used for treatments, the conditions were poor for wintering and spring feeding of caterpillars of this pest, since no grain remained on the surface after plowing and wheat shoots, even when sown early, appeared already at the start of pupation. Only specimens that were well-nourished since the fall survived, for which even brief feeding in the spring was sufficient. However, in the summertime, on the contrary, very favorable conditions developed for the pest: heading of wheat occurred during the period of mass flight of butterflies, which was instrumental in full expression of their enormous reproductive potential. All this caused drastic fluctuations in number of rustic moths: years of profound depression alternated with years of mass reproduction.

Things are different now. Use of subsoil cultivators, with which there is preservation of a large part of the stubble and grain dropped during harvesting provides for good survival of caterpillars in the winter. In the spring, they can feed until the start of presowing work on the soil, which is usually done in the second to third 10-day periods in May (at this time, the caterpillars have already finished feeding). On the other hand, late presowing cultivation and sowing destroy a considerable part of the prepupas of this moth, which are very sensitive to mechanical injury. As a rule, 10 to 30% of the population survives, and then only specimens that underwent pupation after sowing. As a result, caterpillars of the first ages develop at low temperatures and reach only the fifth age when harvesting begins, whereas before, with the terraced system of working the soil they reached the sixth age. There was substantial decline of the role of parasites in regulating the number of pests. Evidently, this is attributable to worsening of conditions for entomophage development: extensive use of herbicides virtually destroyed flowering plants and deprived imagoes of a source of additional food. In addition, the most effective parasites of the rustic moth (Meniscus agnatus, Tachina magnicornis, Villa circumdata and others) hatch before appearance of host caterpillars in the case of superficial tilling.

All this eliminates the drastic difference in number of pests between years of mass reproduction and depression. Thus, the maximum number of caterpillars during the last reproduction period in 1980 was 150-200/100 spikes, whereas in 1960 there were up to 1600 specimens. Nor are there any severe depressions, such as occurred in 1961-1962, when caterpillars could be found with great difficulty.

The barley flea beetle was considered one of the dangerous pests of grain crops before introduction of the soil-protective system. It infested crops severely (population density was up to 2000 specimens per square meter). In recent years, there have been 20 to 300 beetles per square meter, while the volume of chemical control of this pest decreased to about one-tenth. The drastic decrease in damage done is attributable to the fact that the shoots of grain crops appear only in late May to early June, when the beetles have already finished laying eggs and die off.

Thus, the schedule for sowing grain crops followed in this zone resulted in the fact that the barley flea beetle is no longer among the most important mass scale pests.

However, as we have already mentioned, superficial tilling created beneficial conditions for development and mass reproduction of stem-hiding pests and nongregarious locusts on the crops.

Analysis has shown that failure to adhere to the crop rotations adopted in the zone, reduction of area to be left fallow and flat-cutting tilling, which is favorable for wintering of puparіums right on the fields from under the grain crops, were instrumental in mass reproduction of the hessian fly.

During the period of mass reproduction of the hessian fly in North Kazakhstan in 1978-1980, it infested large areas in Kustanay, Kokchetav and Turgay oblasts.

Nongregarius locusts periodically caused appreciable losses in the past also. They deposited egg packets on the berms of fields, virgin and fallow land, and when wild vegetation was burned out they migrated to grain fields, where they inflicted damage more often on the periphery of the fields. At the present time most of the locust population winters on the fields, while the wild areas and sown cereal grasses are no longer their main reservations.

When the population density of nongregarius locusts is high, they destroy all the leaves, whereas some, such as the white-banded locust, also damage the spikes. The loss of wheat grain harvest could amount to 1-1.6 q/ha when there are 12-17 specimens/m^2.

Our studies enabled us to assess the main elements of the soil-protecting system of agriculture and find the ways of using some of them as effective steps to restrict the number and harmfulness of the most dangerous insects.

Presowing tilling of the soil in the spring and proper choice of time for sowing grain crops are quite effective. In some years, this eliminated the need for insecticides. Thus, presowing cultivation to a depth of 6-8 cm at a late time (22-25 May), when mass pupation begins of caterpillars of the rustic grain moth, causes destruction of up to 70-90% of the prepupae and pupae. On late-planted crops, the number of new-generation caterpillars may be one-fifth to one-10th smaller than on early ones. Moreover, presowing treatment, which destroys weed shoots and windfall deprives pointed-head and grain bugs, barley flea beetles, leafhoppers, click beetle larvae, etc., of food, and causes a reduction in their number.

Sowing time affects the number and extent of harm of the barley flea beetle. Thus, in 1970-1978, at the Chervonnyy Sovkhoz in Kokchetav Oblast, its population ranged from 700 to 1500 specimens/m^2 on barley sown on 5-7 May, 60-170 when sown on 20-22 May and 15-30/m^2 when sown on 27-30 May. Consequently, when grain crops are sown at the optimum time (15-30 May), this beetle has no relevance as a pest.

On wheat fields sown at the latest allowable time (22-25 May), there is more than 40% reduction in infestation of spikes by larvae of wheat thrips (from 55 to 32 specimens per spike) and to one-fourth by the grain lacebug (from 16 to 4/m^2); there is also reduction in infestation of plants with stem beetles (from 11-15 to 0.2-0.5%) and hessian flies (from 60 to 27-40%).

Our 1976-1980 experiments at the Ruzayevskiy Experimental Station revealed that infestation of wheat by sucking pests is substantially restricted by application of superphosphate (P_{20} in rows when sowing or P_{120} in a fallow field), laser irradiation of seeds, treating them with tur [plant growth regulator of the chlormequat chloride type] (5 kg/ton seeds) followed by sowing on fertilized soil: infestation by grain aphids was reduced to 1/2-1/5th. Under such conditions there was more intensive progress of stages of wheat organogenesis (vegetation period was reduced by 3-4 days, as compared to the control), which is what apparently caused the difference in aphid infestation of the plants.

There has been a production trial of the method of calibration, or separation of seeds into fractions, which permits reduction of grain harvest loss due to the wheat thrips. In essence, the method consists of separating small fractions of grain from a batch of seeds (those passing through sieves with 2.0-2.2×20 mm mesh), which are the most stricken by thrips larvae. With calibration, the harvest increment constitutes 1.9-2.1 q/ha.

These results enable us to recommend calibration for farms in the steppe zone as one of the effective means of reducing harvest losses, not only due to wheat thrips, but the entire set of sucking pests, since there are undersized caryopses infested with bugs and aphids in the sifted waste.

Proper alternation of crops in crop rotations not only improves soil fertility, but serves as an extremely important measure to depress harmful organisms. The 4-5-field grain-fallow crop rotations recommended for North Kazakhstan result in gradual accumulation of many dangerous pests by the end of the rotation, while in fallow fields there is clearance of weeds, gray rustic moth, wireworms and other pests, and ultimately the number of most of them in crop-rotation fields is considerably smaller than with a one-crop system of growing grain alone.

There was also mild infestation of durum wheat by the flower mite when sowing corn, barley and bread wheat on fallow land. When only durum wheat is grown on one field for 2 or more years, infestation of spike flowers by this mite could constitute 30-90%.

Since 1981, there has been an entomological evaluation of five-crop grain-fallow rotation at the Stepnoishimskiy and Turgay experimental stations: fallow--wheat--wheat--oats--wheat. It was found that the second crop after fallow is infested the most with sucking and stem-hiding pests (grain aphids, leafhoppers, frit flies and stem fleas). Introduction of a third crop of oats in rotation reduces the number of wheat thrips and wheat node Erytomidae [joint worms] (by 40%), but has little effect on leafhopper infestations.

In oat and wheat fields, there was considerable reduction (to about 1/3-1/4th) in number of the principal pests on oats: rustic shoulder-knot moth, grain aphids, grain bugs, but also reduced the number of entomophages, such as Coccinelidae, green lacewings and predatory bugs (on fields where different tilling methods are used, their number was highest in the case of subsurface cultivation).

On the whole, in crop rotations where oats are the third crop after fallow, loss of grain harvest due to pests was about 10-20% less than when the preceding crop was spring wheat.

Investigations have started of varietal resistance of new, promising cultivars of spring wheat zoned for North Kazakhstan, Tselinnaya 21 and Omskaya 9, to the most important pests and diseases. It has already been established that the rustic shoulder-knot moth, sucking and leaf-hiding pests develop more intensively on these cultivars than on Saratovskaya 29, because they are sown 5 days earlier.

The time and quality of harvesting also have an appreciable influence on number of pests. For example, a 10-day delay doubles losses due to the the rustic moth, whereas when harvesting is done at the proper time, most of the pests are removed from the field together with the grain.

Early separate harvesting, with as low as possible cutting of stubble and use of stalk-pulling equipment lowers appreciably the damage done by hessian flies.

When harvesting is done at a late time, much windfall remains on the fields, as a result of which there is food in the fall and spring of the next year not only for larvae of the gray rustic moth, but for plant bugs, shield bugs, Muridae and other pests. All this is favorable for their survival and reproduction.

To sum up the above data, it can be concluded that one can lower significantly the number and harm done by dangerous pests and reduce the amount of pesticides used and, in a number of instances, eliminate the latter entirely, by making purposeful use of several agrotechnical procedures.

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EFFECTIVE CROP ROTATION WITH EMPHASIS ON GRAIN CROPS

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 28-29

[Article by A. N. Zyryanova and F. A. L'vova, senior scientific associates at the Scientific Research Institute of Agriculture of the Northeast: "In Intensive Crop Rotations"]

[Text] The constantly increasing need for grain is leading to an increase in saturation of land with grain crops. In Kirov Oblast, their share in the structure of planted areas constitutes 54-56%. However, at most farms, field crop rotation is being introduced, in which grain crops constitute 70-75%. For this reason, it is necessary to scientifically validate field crop rotations with consideration of different shares of grain crops.

We set up a permanent experiment for investigation of the efficacy of the following crop rotations: 1) peas + oats for green fodder -- winter rye -- potatoes -- barley --clover -- oats (50% grain crop saturation); 2) clover -- clover -- winter rye -- peas -- winter rye -- barley (66.7% grain crops); 3) clover -- winter rye -- peas -- winter rye -- oats -- barley (83.4% grain crops); 4) peas -- winter rye -- barley -- winter rye -- oats -- spring wheat (100% grain crops). The experiment was repeated 4 times and the experimental plot was 154 m^2 in size. In the plowed layer, the total of absorbed bases constituted 11-14.4 mg·eq/100 g soil, base saturation was 70.9-71.9%, hydrolytic acidity was 4.3-5.9 mg·eq, with 1.2-6 mg mobile aluminum, 6.4-11.9 mg P_2O_5, 10.9-13.4 mg/100 g soil K_2O, 1.5-2% humus and salt extract pH of 4-4.3.

The agrotechnical measures were the conventional ones for Kirov Oblast. Fertilizer dosage was determined with consideration of drift of nutrients and coefficients of their uptake from soil and fertilizers. The crop rotations included cultivars zoned to the area: winter rye--Vyatka 2, Sever 1 barley, Falenskiy 1 oats, Leningradka spring wheat, Krasnoufimskiy 70 peas, Lorkh potatoes and Kirovskiy 159 clover.

In the experiments, we determined weed infestation of crops when there was mass appearance of weeds and prior to harvesting by the quantitative and weighing method. The most widespread grain crop disease in our area is root rot, and since crop rotation plays a significant role in protection against it, expressly this disease was the subject of our investigation. Involvement of

grain crops in root rot was determined during the periods of tillering, heading and prior to harvesting; in all of the variants we took yield into consideration.

Least weed infestation was observed in the first rotation with a row crop. There, we found 27.5 specimens/m^2 of weed plants (air-dried weight 9.5 g) during the period of massive appearance of weeds, versus 33.5-38.1/m^2 (9.6-13.4 g) in other crop rotations. There was a tendency toward increased weed infestation with increase in share of grain crops in the rotations: on the average for a 5 year period, in the first rotation there were 16.8 weeds/m^2 prior to harvesting, 23.8 in the second, 25.7 in the third and 27.8 in the fourth. The extent of infestation with annuals and biennials was mild, and with perennial weeds it ranged from mild to moderate.

Root rot spread more intensively in years with excessive precipitation and low temperatures, when seed germination was protracted and there was a longer period of seedling infection, as well as in a year with a dry month of May and cold June. Under adverse conditions, the plants were weakened and more susceptible to disease. From 1 to 7% of the shoots perished, in the tillering phase there were 15-20% diseased barley plants, 5-18% oat and up to 48.5% winter rye plants.

The severity of root rot also depended on the precursor. It was manifested the most severely on winter rye when it was sown after barley: on the average there were 72.3% diseased plants in such fields over a 5-year period, with 37% extent of involvement, whereas when winter rye was spaced with clover, the figures were 56.7-63.9% and 24-27.4%, respectively, with peas --58.5-61.7 and 24.3-30.3%, and with a peas and oat mixture--58.9 and 26.1%; with increase in proportion of grain crops in the rotations, there was increase in susceptibility of winter rye to root rot. Barley was stricken the least when it was sown after oats. Thus, in barley fields following winter rye the disease was found on 56-58% of the plants (with 23.9-26.6% severity of disease development) and after oats on 43.2% (19.7%). Barley was stricken less than winter rye, but oats were the most resistant, and this resulted in lower infestation of the grain crops after them. On the whole, the increase in share of grain crops in the crop rotation intensified spread of the disease.

The largest harvest of winter rye was obtained after clover fallow--32 q/ha; after a pea-oat mixture and peas, it was 2.4 q/ha less and after barley, 3.5 q/ha less. The decline of rye harvest after a grain precursor was more perceptible in meteorologically inclement years. We failed to observe appreciable differences in spring grain crop harvest as a function of precursors.

On the average, there was some decline in yield of grain crops when they dominated in the crop rotations: in the first rotation, grain harvest constituted 31.7 q/ha, in the second 30, in the third 30.7 and in the fourth 30.9 q; however, in some years grain productivity declined more appreciably, by 2.3-3.6 q/ha, with intensive crop rotations.

On the basis of the results of the studies, it was recommended that specialized crop rotations with up to 60-80% grain be used at farms where farming is

practiced with sophistication. Such crop rotations are being adopted in the southern and central zones of Kirov Oblast. When selecting crop rotation programs, one must take into consideration the difference in susceptibility to root rot: greater for winter rye and barley, less so for oats.

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SEED SIZE AND VIABILITY OF PHYTOPATHOGENIC FUNGI

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 29-30

[Article by R. N. Fedorova, T. N. Filippova, junior scientific associates at the All-Union Institute of Plant Protection, A. Ya. Semenov (deceased) and V. A. Volkova, senior scientific associate at the Northwest Scientific Research Institute of Agriculture]

[Text] In 1978-1980, we investigated the role of seed size on survival of fungi on fields of the Northwest Scientific Research Institute and in the mycology laboratory of the All-Union Institute of Plant Protection. We analyzed fractions of barley seeds of the Moskovskiy 121 spring variety passing through sieves with 3, 2.8, 2.5 and 2 mm mesh size. Seeds that were not separated into fractions served as a control. The tests were repeated four times, plot area was 20 m^2, and there was successive placement of variants. The seeds were sown (on the basis of 5 million/ha) in accordance with their economic suitability and weight per 1000 seeds.

The phytosanitary condition of the seeds was checked at different phases of plant development: seedlings, milk-ripe and yellow-ripe stages, harvest time. At each of these stages we collected samples of 100 seeds in each experimental variant or 100 plant roots with the radical part, four times.

We used the biological method to determine morbidity ("Methodological Instructions for Determining Infestation of Seeds and Seedlings of Grain Crops with Fungal Diseases," 1976). The seeds were washed thoroughly in gauze bags for at least 2 h; they were then sterilized in 0.1% silver nitrate solution for 1 min, again washed in sterile water and, after drying with sterile filter paper, they were spread on Czapek nutrient medium in Petri dishes, with addition of growth-restricting agents (deoxychylate, medical bile). Pathogens were identified on the 5th day, or else we used the "roll method": seeds were spread on filter paper (strips 115 cm long 10 cm wide) soaked in water, with the embryo down along a line traced with a pencil, 2 cm away from the top edge. We placed 100 seeds 1 cm apart on each strip and covered them with a wet piece of filter paper of a smaller size, on top of which we placed apron or polyethylene; all this was rolled up, placed in a container and put in an incubator for 7-8 days at 20°.

It was established that small seed fractions (2 and 2.5 mm) and control seeds are stricken the most severely. Thus, we encountered 17-33% diseased seedlings in the control, while extent of disease development constituted 11-14.5%; in fine fractions, the figures were 19-35% and 8.5-23%, respectively; in fractions 2.8 and 3 mm in size, there were 8-24% diseased seeds and 5.7-23% disease development.

Largest seed fractions, 3 mm in size, produced the largest harvest--39.9 q/ha (average over a 3-year period), harvest constituted 36.3 q/ha from fractions 2.5 mm in size and 33.5 q/ha for those 2 mm in size; the figure for the control was 38 q/ha.

The maximum number of diseased plants was referable to the milk-ripe stage (average 28.8%), while highest disease development was observed in the germination phase (average 14.6%).

The phytopathogens were represented by fungi of the genera Fusarium, Helminthosporium, Alternaria and Penicillium, as well as mixed infection by species of all these genera. At the seedling stage, helmonthosporiosis constituted 29.6%, fusariosis 12.8%, penicilliosis 2.6%, mixed infection 0.6%, alternariosis 0.4%; at the milk-ripe stage: 69.6% fusariosis, 27.7% mixed infection, 2% helminthosporiosis, 0.6% alternariosis, with no penicilliosis or isolated cases; at the yellow-ripe stage mixed infections constituted 77%, fusariosis 19.3%, helminthosporiosis 3.5%, with no alternariosis or penicilliosis. In new-harvest seeds, fusariosis constituted 26.6%, helminthosporiosis 21.4%, alternariosis 3.6%, penicilliosis 2.4% and mixed infection 1.2%.

As shown by this experiment, fungi of the genus Fusarium were the principal pathogens at all phases of plant development, there was an exception only in the seedling phase: some prevalence of helminthosporiosis over fusariosis.

The fractions 2.8 and 3 mm in size bore somewhat fewer infectious primordia of Fusarium fungi than the others.

As to species composition, among fungi of the genus Fusarium, up to 48% were referable to F. oxysporum, 42% to F. avenaceum, 6.5% to F. gibbosum and 3.5% to F. javanicum. Among Helminthosporium fungi, we encountered Bipolaris sorokiniana (H. sativum). We did not identify the species of Alternaria and Penicillium fungi.

This investigation shows that small fractions of seeds are the poorest in the phytosanitary respect and produce the smallest harvest. Obviously, it is not expedient to use them for sowing.

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AUTUMN USE OF HERBICIDES

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 31-32

[Article by L. M. Izvekova]

[Text] Under conditions that are favorable for their development, perennial weeds could lower harvests appreciably and eliminate the efficacy of industrial technologies for growing agricultural crops. There is drastic intensification of distribution of perennial weeds--creeping thistle, corn or yellow sowthistle, couch, lesser bindweed and many others--due to infraction of agrotechniques, failure to practice crop rotations, as well as soil cultivation without spreader.

In order to reduce the number of perennials, scientific research institutions have suggested that salts or esters of 2,4 D, raundap or its analogues (nitosorg, utal, phosulen), sodium trichloroacetate and other herbicides be used in the fall.

2,4-D (amine salt, butapon, octapon) is applied when the soil is cultivated in the fall [or when frozen] for sowing spring crops, to control such harmful weeds as sowthistle, lesser bindweed, mosquito plant and Siberian lettuce. After the stubble is cut (with plowshares or subsurface cultivators or BDT or BDT-10 disk harrows), the soil is tilled in two tracks, criss-crossed, with clipping of perennials that are sprayed with herbicides after they have grown and rosettes or runners have appeared. The field is plowed 10-12 days later.

Best results are obtained when air temperature is 18-20° at the time of treatment. At lower temperatures (10-14°), one should not use amine salt, and use only esters. Esters are applied at the rate of 2-3 kg/ha or amine salts at the rate of 3-5 kg/ha and plowing is performed only 14-16 days after spraying, to allow time for the herbicide to penetrate into the weeds' root system. With use of herbicides combined with fall cultivation of the soil for 2-3 years in a row, the fields are virtually free of perennials. Liquid agents are used at the rate of 300-400 ℓ/ha.

One can use agents based on glyphosate--raundap, utal, nitosorg (36% aqueous solutions) or phosulen, 50% wetting powder--in the postharvesting period on

fields that will be used the following year for spring grain crops, corn, vegetables, cotton and perennial cereal grass for seeds. They are used at the rate of 4-10 ℓ solution or 2.8-7.2 kg wetting powder per hectare. These are systemic herbicides; they migrate readily over vessels from leaves and stalks to the roots, rhizomes and stolons of perennial weeds. Their action appears 7-14 days after treatment, and the plants dry up completely within 1 month. Maximum efficacy of raundap and its analogues is manifested when it is applied to the well-developed leaf surface of the weed at the stage of active growth, at high relative humidity, intensive illumination and absence of rain for 6-12 h after use. It is best not to submit perennial weeds to mechanical treatment before applying the herbicides. Cultivation and plowing are performed 7-14 days later.

Liquid is used at the rate of 300-400 ℓ/ha. It is necessary to check equipment for proper condition and obtain uniform wetting of weed leaf surface, almost to the point of dripping from it. Best results are obtained with such treatment.

The perennial species differ in sensitivity to glyphosate, so that there are differentiated standards for its use: with application at the rate of 1-1.8 kg/ha active ingredient, there is destruction of Johnson grass, couch, common reed and sorrel [or dock]; with 2-2.8 kg/ha this applies to creeping thistle, corn and yellow sowthistle; with 3-3.6 kg/ha--goutweed, horsetail, lesser bindweed, Bermuda grass, ivy and others.

One should take precautions so as not to damage crops nearby. One should not use the agents under high pressure, which yields fine droplets in the spray, nor should one add surfactants that can worsen the effect of the herbicide.

Working solutions of utal, phosulen, nitosorg and raundap can be prepared in enameled, wood, polyethylene or stainless steel containers, but not in those that are made of zinc-plated or uncoated steel, since agents with pH of 4.5-5 can react with the material of the container. To avoid corrosion, it is necessary to thoroughly wash the sprayers after use, solutions must not be left in equipment and containers used to prepare them.

Sodium trichloroacetate, 20-45 kg/ha, is used in the fall with industrial technology of raising potatoes, flax, cabbage, beets and carrots to control couch and other cereal crop weeds. It is applied on flax fields after disking the layer of perennial grasses or cutting stubble to a depth of 10-12 cm at the rate of 20 kg/ha on sandy loam, 30 kg on loamy soil and 40-45 kg on heavy soil.

When performing extra and flooding irrigation on fields to be planted with cotton in Central Asia, particularly, Turkmenia and Tajikistan, sodium trichloroacetate in a dosage of 100-120 kg/ha is effective in destroying Johnson grass, Bermuda grass and nut grass. In Uzbekistan, dalapon (40-55 kg/ha) is used in the fall for control of Bermuda grass, Johnson grass and other perennials.

The All-Union Scientific Research Institute of Corn Growing has proposed the use of atrazine in dry regions after fall plowing, at the rate of 6 kg/ha when cultivating the crop in permanent plots.

Fall use of herbicides against one of the most devastating weeds, wild aot, merits attention. The All-Union Scientific Research Institute of Soybean Growing has obtained good results with the use of treflan on meadow-chernozem-like soil when plowing frozen fields to be used for soybean growing. The herbicide was placed in the soil from 1 September until daytime frost is well-established. Wild oats growing in the top soil were 80-90% destroyed; in the case of sprouting from a depth of 15-20 cm, the root system did not make good contact with the herbicide and it had an insignificant effect, so that on fields strongly infested with wild oats treflan was applied before the presowing cultivation of soil and turned with cultivators or disk equipment.

Triallate is effective against wild oats and other cereal crop weeds in fields of grain and flax. Our industry puts it out in the form of 40% emulsion concetrate. This herbicide is used before sowing, with working into the soil. For fall application without raking it into soil, 10% granulated product is recommended (10-25 kg/ha). Thus far, use of emulsion in the fall has not been investigated although such a procedure is promising, according to data in the literature.

Fall application of herbicides enables the farm to successfully control destructive weeds, obtain additional harvest when crops are raised using industrial technology and make wise use of equipment and manpower.

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PLASMA JET SEED SPRAYING DOES NOT PROTECT THEM AGAINST DISEASES

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 p 33

[Article by S. F. Buga, head of phytopathology laboratory at the Belorussian Scientific Research Institute of Plant Protection, V. V. Nikolayeva and N. N. Lukashik, senior scientific associates]

[Text] It is generally recognized that seed treatment for control of diseases of agricultural groups is effective, and it requires no proof. Nevertheless, broad use of this procedure in agriculture still involves certain difficulties.

Scientists and practical workers have repeatedly tried to replace pesticides, which are used to disinfect seeds, with harmless agents, for example, cone meal, or else to change to a different disinfection method using various types of radiation, electromagnetic waves, electrostatic field, etc., but thus far they have not succeeded. For this reason, we are alarmed by the appearance in the press of recommendations that are not sufficiently validated or tested, in particular, concerning use of various equipment to treat seeds before sowing for control of plant diseases. The heads of some farms, attracted by the advertisements, cancel treatment in the hope of obtaining a harmless method of decontaminating seeds, without concern for expense, and acquire these devices, and about 2 years later drastic outbreaks of smut-type diseases are observed at such farms.

In 1983, the staff of the phytopathology laboratory at the Belorussian Scientific Research Institute of Plant Protection tested the 04 FP-1 plasma-jet equipment proposed by the All-Union Scientific Research Institute for Electrification of Agriculture.

According to the authors' recommendations, this device is intended for presowing treatment of seeds of grain, legume and groat crops in order to decontaminate them from covered and wheat smut, root rot, bacteriosis and spot disease.

When seeds are passed through this device, they are submitted to gas-plasma treatment at temperatures of 2300-6000°. For field tests, we used seeds of Favorit and Mami varieties of barley and Belorusskaya 80 spring wheat, and for the production test conducted at the Annopol' experimental base in Minskiy Rayon, we used Favorit (superelite [superior quality]).

Table 1.

Variant and agent use (kg/ton)	Presowing seed contamination, (%)		Germination in the field (%)
	overall	helmintho-sporiosis	
Mami cultivar			
Control (without treatment)	78.5	61.5	83.6
Granosan, 1.5	0.0	0.0	94.1
Vitavax, 2	1.5	0.5	87.3
One plasma treatment	78.0	53.5	84.0
Favorit cultivar			
Control (without treatment)	90.5	76.5	85.1
Granosan, 1.5	0.5	0.0	92.4
Vitavax + TMTD (1.5 + 1.5)	0.0	0.0	88.6
Thermal decontamination + TMTD, 1.5	0.0	0.0	84.7
One plasma treatment	87.5	70.0	88.0
Two plasma treatments	85.0	76.0	87.2

Table 2.

Variant and agent use (kg/ton)	% diseased Mami barley in vegetation period			
	reticulate helminthosporiosis on seedlings	striate helmintho-sporiosis	root rot (% devel-opment)	smut
Control (no treatment)	10	1.13	19.0	0.89
Granosan, 1.5	0	0.00	10.8	0.87
Vitavax, 2.0	2	0.15	15.5	0.11
Baytan-universal, 2.0	0	0.00	9.8	0.02
One plasma treatment	11	1.08	16.5	1.08

Under production conditions, treatment using the plasma unit was compared to the procedures for presowing seed treatment that are used in the republic's elite-[high quality] seed-growing farms. Treatment was performed in March and April, in accordance with instructions for operating the 04 FP-1 plasma unit in the presence of a representative from the manufacturer plant.

The following mode of operation was used: rate of passing seeds through 0.8 tons/h, electrolyzer current 15 A. They were passed through the unit once or twice at 18- and 4-day intervals. The seeds were allowed to stand (between last treatment and sowing) for 48, 30, 27 and 23 days in the field tests, 24 and 20 days in the production test.

The results of laboratory and field studies revealed that seed treatment in the plasma unit improved somewhat their germination in the field (Table 1). However, in the case of chemical treatment of barley seeds with granosan there was more significant increase in sprouting in the field than with the plasma treatment.

Plant experts established that contamination of seeds with Helminthosporium, Fusarium, Alternaria and other fungi after passage through the plasma unit was on the same level as in the untreated control. According to field findings, there was also no decline in contamination of plants grown from seeds treated in the unit by reticulate and striate helminthosporiosis, root rot and smut (Table 2). Baytan-universal was the most effective of the systemic agents in the control of helminthosporiosis blight and root rot, while among the contact agents granosan was the most effective, baytan-universal and vitavax being best against smut.

Plasma treatment increased somewhat the density of seedlings and number of productive stalks per square meter, as compared to thermal and chemical disinfection, but was considerably inferior to them in protection against root rot and smut. There was no reliable increase in grain harvest as a result of plasma treatment of seeds. Two-fold treatment of seeds on the plasma device had no advantages over a single treatment.

Thus, treatment of barley and spring wheat seeds in the plasma device does not decontaminate seeds with regard to pathogens of smut and root rot, and does not provide subsequent protection of plants against diseases.

* * *

Pilot Conference

In Kustanay there was a conference dealing with airborne control of weeds in Kazakhstan. There was discussion of problems of wise use of aviation equipment, herbicides and timely servicing of aircraft. The conference participants shared their experience in using UMO [expansion unknown].

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ESTIMATION OF WEED LEVELS IN FIELDS AS BASIS FOR PREDICTING THEM

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 44-45

[Article by V. V. Isayev, chief of herbicide laboratory at the Central Institute of Agrochemical Services to Agriculture]

[Text] The results of agrotechnical measures and, particularly, chemical weeding depend significantly on the extent to which full consideration is given to extent of weeds in the fields and species composition of the weeds. For this reason, it is not by chance that much attention is given in many countries to investigation of weed levels and mapping, which helps make more efficient and wise use of herbicides.

The scientific research institutions of our country are also developing methods of keeping records of weeds, mapping and long-term forecasts of weediness. The department of plant protection at TsINAO [Central Institute of Agrochemical Services to Agriculture] is introducing a standardized system for weed estimation; it is investigating a method of automated transmission and processing of data on computers. In Moldavia, for example, the Glia program set with the YeS-1033 computer was used for this purpose.

The system is based on temporary instructions on estimation of weeds in fields which was developed by scientists at the TSKhA [Timiryazev Agricultural Academy], all-union institutes of grain farming, sugar beets and flax, the VNIPTIKhIM [All-Union Scientific Research, Planning and Technological Institute for Use of Chemicals in Agriculture], SibNIISkhoz [Siberian Scientific Research Institute of Agriculture], TsOS VIUA [Central Experimental Station, or Central Statistical Department, of the All-Union Scientific Research Institute of Fertilizers and Soil Science], Crimean Agricultural Institute, TsINAO and specialists from the All-Union Sel'khozkhimiya (Scientific Production Association for Agrochemical Services to Agriculture]. They call for complete inspection of fields at the times of mass appearance of the principal weed species. The extent of weeds is estimated by a quantitative method, since it is only thus that one can establish potential weed levels and forecast appearance of weeds of each species in a given area or within a specific region.

All types of weeds are recorded when fields are inspected. A note is made of the weeds that are notable for being very deleterious, particularly those

that are subject to quarantine, even if they had not been included in the records. Data entered in the primary record papers reflect the actual weed level in each field referable to the prevalent weed species, and they serve to prepare summary reports of weed levels in each crop raised at a farm. It is not allowed to group together grain, commercial, vegetable and feed crops and perennial plantations, as well as to group different weed species. The record indicates the actual total and inspected area in hectares. It is not permissible to give approximate information about the crops, farms or administrative-territorial division: this leads to major deviations from the data on land balance and distortion of results. The areas are grouped according to extent of weediness, using the following gradations of number of weeds per square meter: 1-5, 5.1-15, 15.1-50, 50.1-100 and more than 100.

The summary report of weed levels indicates the code (number) for administrative divison, crop and weed species; the appropriate classifiers for the sector are used for this purpose.

When filling out the columns, the numerals must be written properly and clearly. Errors arise because of inaccuracies, which build up when data are processed on a computer, there is distortion and loss of value to the results of inspections.

Summary reports on farms containing information about weed levels in crops are received at the rayon level Sel'khozkhimiya by the plant protection station. When summing up the results of inspections in a rayon, all weed species are listed that have been found at the farms for each crop. Gathering of data and summarization of information about weed levels in fields, perennial plantations, cultivated hay meadows and pastures in the rayon must be ended on 15 September; summary reports are forwarded to oblast, kray and republic-level Sel'khozkhimiya associations to the specialist in the plant protection administration.

The reports, filled out in accordance with all requirements, are forwarded by 1 October to the department of plant protection of TsINAO, where the information is transferred to computer hardware. The following is determined with use of computers: in the first place, the area of farm crop fields inspected for weed levels in groups (grain and leguminous, commercial, vegetables, cucurbits and potatoes, fodder crops on plowed land, perennial plantations, hay meadows and pastures); in the second place, total weed levels for each cultivated crop and area infested with a given species of weed, as a whole and in gradations of number of weeds of the species per square meter; in the third place, weed levels in farmland, including plowed land, perennial plantations, hay meadows and pastures.

The inspections revealed that there were more than 90 weed species in sowed and planted fields, 20-30 of which are the most harmful. Determination of the criteria of harmfulness and degree of infestation of the main groups and species for each crop and locality serves as the basis for recommendations as to scope of chemical treatments and validation of need for herbicides.

Information about weed levels and species is necessary in order to prepare long-term forecasts of distribution of weeds and develop combined measures

to control them. One can determine the future herbicide requirements on the basis of such forecasts and, consequently, plan their production and delivery in advance, as well as refine organization and technology of herbicide use in different zones of the country, develop early enough a system of agrotechnical and chemical measures, depending on appearance and distribution of resistant weed species. Forecasting the weed levels makes it possible, in a number of cases, to reduce or eliminate chemical treatment entirely, as well as to determine the optimum proportion of fertilizers, chemical enhancers and herbicides.

As a result of summarization and analysis of data in the weed-level records for 1981-1983, the herbicide laboratory of TsINAO prepared summary data on weed levels in the principal crops as a whole in the country and for different Union republics, volume of herbicide use and plans for their future use on 28 crops--winter and spring grain, corn for seed, sugar beets, cotton and others; recommendations have been prepared on chemical weeding with consideration of the species composition of weeds.

Determination of the most typical weeds for each zone and their range is the foundation for choosing the system of protective measures. Certain weed species appear, depending on environmental and climate conditions, presence of nutrients in the soil and crop that is raised. Thus, in winter wheat fields, the most frequently encountered weeds are loose silky bent, scentless mayweed, cornflower and shepherd's purse; on spring wheat and barley fields--corn cockle, darnel, lesser bindweed and knotweed species; on flax fields--hardy ryegrass, flax spurrey, gold-of-pleasure, flax dodder, flax knotweed; on winter rye--rye and field brome, cornflower and hemp-nettle; on cotton fields--Johnson grass, Bermuda grass; on sunflower fields--sunflower weed and sunflower broomrape.

It was established that there has been a change in recent years in species composition of weeds in grain crop fields, with spread of species that are resistant to herbicides of the 2,4-D group. There, the corn sowthistle, creeping thistle, lesser bindweed, couch, scentless mayweed, wintercress, cornflower and wild buckwheat are prevalent. Thus, in Volgogradskaya Oblast, 66.2% of the inspected fields of winter crops are infested with creeping thistle, 46.2% with lesser bindweed and 24.3% with couch; in Kharkov Oblast, 19% are infested with creeping thistle and 21% with lesser bindweed. Chemical weeding of winter crops is performed on an average of 30% of the planted area, but 2,4-D and 2M-4Kh group agents are used the most; to eradicate the above-mentioned species resistant to these agents, the farms must have 2M-4KhP, dialen, diamet-D, diapren, lontrel and others.

Spring grain crops are infested mainly with corn sowthistle, creeping thistle, lesser bindweed and wild oat. In Tselinograd Oblast, sowthistle and creeping thistle are distributed on 43.8% of the fields, wild oat on 15.6%; in Tambov Oblast sowthistle and creeping thistle are present on 69.7% of the fields and wild oat on 29.3% of the inspected areas. Herbicides are used on 40-46% of the spring grain crops which is obviously insufficient with the existing composition of species and quantity of weeds. In addition to 2,4-D derivatives, one should use triallate, suffix, dialene, diaprene, 2M-4KhP and lontrel for

more effective control of weeds on these crops and, on spring crops with addition of leguminous grass, bazagran-M and 2,4-DM should be used.

Sugar beets are particularly sensitive to weeds, even when the latter are present at minimal levels. The following are the main weeds encountered on the fields: among annual and biennial grain weeds--globe thistle and bristle-grass species; among annual and biennial dicotyledons--white goosefoot, redroot and knotweed species; among perennial dicotyledons--creeping thistle, corn sowthistle, lesser bindweed; among perennial cereal weeds--couch. In one of the largest beet-growing oblasts, Voronezh, bristle-grasses have infested the entire inspected area, creeping thistle was found in 94.1% of this area, corn sowthistle in 28% and couch in 33.3%; in Kirovograd Oblast, bristle grass was found on 75.4% of the fields, creeping thistle on 70.7%, white goosefoot in 46.9% and globe thistle on 38.2%. To suppress the dicotyledon and monocotyledon annual or biennial weeds, betanal, dual, curb-50, lenacil, ronite, fenazone, eptam are needed; for cereal annual weeds--illoxan, nortron, kusagard, and for perennial weeds lontrel, as well as commercial herbicide mixtures.

Weeds inflict much more damage to corn than ear grasses. With use of industrial farming technology, there is drastic reduction in number of inter-row treatments, and herbicides play the leading part in weed control. The principal weeds of corn fields are the globe thistle, bristle-grass and knotweed species, redroot, creeping thistle, white goosefoot, wild mustard, lesser bindweed and sowthistle. In Moldavia, 45.2% of the inspected area is infested with globe thistle, 83.3% with bristle-grass, 50.4% with redroot, 35.4% with creeping thistle, 23.6% with sowthistle; in Nikolayev Oblast, 76.1% of the area is infested with bristle-grass, 38.4% with globe thistle and 19.1% with lesser bindweed. Eradican, agelon, ramrod, dual, primextra and dialen are needed to eradicate dicotyledon and monocotyledon annual or biennial weeds in corn fields, while oleogesaprim is needed for perennial ones (when treatment is repeated on vegetating plants), as well as lontrel as a supplement to 2,4-D to eradicate sowthistle.

Unlike other plowed crops, sunflower plants withstand annual and biennial weeds well. Perennial weeds, mainly those that form suckers, as well as miliary weeds occupy the largest share in sunflower fields. In Krasnodar Kray, infestation with creeping thistle and sowthistle constitutes over 20% of the inspected area, with 8% for lesser bindweed and 16% for green bristle-grass. Treflan and its domestic form, nitran K, are the most effective agents when growing sunflowers; they are used to protect plantations against cereal weeds. Other species are controlled with prometryn, eptam, devrinol (depra) and kartex-M.

In potato fields, the most widespread perennial cereal weeds is couch; among annual or biennial dicotyledons--white goosefoot, wild radish, hemp-nettle; among perennial dicotyledons--creeping thistle and sowthistle. In Vitebsk, Smolensk and Bryansk oblasts, infestation by white goosefoot constitutes 65.4, 28.9 and 72.3%, respectively, by couch--50.4, 30.2 and 62.5%, by sowthistle--66.4, 85.6 and 63% of the inspected area. For successful control of weeds in potato fields, 2M-4Kh, prometryn, linuron, metazin, meturin, sitrin, aresin, kartex-M are needed, and for autumn treatment of the soil--dalapon and sodium trichloroacetate. Thus far, herbicides are not used sufficiently on potato fields, particularly with use of industrial technology, when manual weeding must be eliminated.

The increasing invasion by weeds of common flax fields is causing great concern; for 20 years already, the herbicide, 2M-4Kh has been used there to control weeds. Scientific research and practice have shown that this agent does not destroy completely such weeds as white goosefoot, wild radish and field penny-cress, and regular use of this herbicide on flax fields leads to the spread of resistant weeds--scentless mayweed, field spurrey and hemp-nettle. There has been an increase in invasion of flax by the specialized destructive weed, the hardy ryegrass. In all, 50% of the farmed area is strongly invaded by weeds. In order to clear annual dicotyledon weeds from flax fields, one should make broad use of basagran M, whereas to control resistant weed species one should use aresin, linuron, and trillate to control ryegrass.

In cotton fields, the main perennial weeds are Johnson grass (Sorghum halepense), Bermuda grass, common reed and couch; annual and biennial dicotyledon weeds widely represented are white goosefoot, black-berried nightshade and white amaranth; with lesser bindweed the most prominent perennial dicotyledon. Inspection of fields in Azerbaijan revealed 95.1% invasion by Bermuda grass, 84.8% of the area by couch, 64.8% by white amaranth, 75.1% by burweed; in Uzbekistan--6.8% by Bermuda grass, 20.5% by white amaranth, 16.7% by Johnson grass, 7% by black-berried nightshade and 8% by lesser bindweed. The relatively low weed invasion in Uzbekistan is attributable to the fact that estimate of weed levels was made after use of herbicides and interrow tilling of the crops. With use of industrial technology of cotton farming, the role of chemical protection against weeds increases; herbicides must assure pure plantations until the crop is harvested, for even in this period the weeds cause damage, making harvesting difficult and lowering the quality of gathered fiber. Treflan, kotoran, kotofor, prometryn are effective in control of dicotyledon annual-biennial and perennial weeds, while sodium trichloroacetate, dalapon and raundap are effective for perennial cereal grasses.

According to the results of inspections made in 1981-1983, weed invasion of other crops (essential-oil bearing plants, fruit trees and grapes, tobacco, vegetables and cucurbits, annual and perennial grasses, cultivated hay meadows and pastures) constituted 98%.

It is unwise to use the same traditional herbicides, which are ineffective, to control resistant weeds which are present on 10 to 32% of the farmed areas (and 57% in flax fields). It is imperative to have a set of agents that are designed to destroy the prevalent species, mixtures of herbicides, as well as to adopt specialized agrotechnical measures.

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CONTROL OF POTATO DISEASES DURING STORAGE

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 47-48

[Article by Ye. I. Andreyeva, department chief at All-Union Scientific Research Institute of Chemicals Used for Plant Protection, and Ye. I. Fursenko, junior scientific associate]

[Text] During storage, seed tubers may be stricken with various diseases.

Phytophthorosis (the pathogen of which is the lower fungus, Phytophthora infestans) develops on potatoes in the vegetation period, and particularly in the second half of the summer. It is spread by zoospores, which can sprout over a wide range of temperatures (2-30°) at high humidity. It is manifested in the form of rusty-brown spots on the leaves, after which depressed brown spots are formed. Sometimes the infection may be latent. Diseased tubers then become the source of infection.

Dry rot is caused in warehouses by fungi of the genera Fusarium (F. solani, F. sulphyrum, F. sambucinum, F. coeruleum and others) and Phoma (Ph. tuberose, Ph. solanicola). Not infrequently, pathogens of both genera are encountered together. Fusariosis rot may start in the field; it develops intensively in warehouses at temperatures of 17-25% and relative humidity of 70%. Tubers become undersized and the pulp is entirely destroyed.

Phomosis is also known under the names of button rot or potato gangrene. Small ulcers or necrosis appear on the tubers; when there is severe development of the disease, the ulcers grow deeper, and as a result cavities are formed. When stricken tubers are planted seedlings are less densely arranged. Sick tubers are the primary source of phomosis.

Various forms of scab--powdery, silver, ridged and rhizoctoniosis present a great hazard during storage. Hard black spots, warts resembling clumps of dirt are formed on tubers that are stricken with rhizoctoniosis (pathogen--the fungus Rhizoctonia solani) during storage. The disease is particularly dangerous for young seedlings; if they survive they grow in a diseased form, the tubers from diseased bushes are sources of infection in warehouses. Optimum temperature for development of rhizoctoniosis is 9-27°.

In the case of powdery scab invasion (pathogen, the fungus Spongospora subterranea), brownish spots with brown veins appear on the tubers, which then change into gelatinous convex pustules. The skin breaks in such areas, exposing a dark powdery mass. The tubers grow susceptible to other diseases. Powdery scab develops throughout the storage period.

Silvery scab (pathogen, the fungus Spondilocladium atrovirens) appears in the warehouse in early spring in the form of silvery-gray spots on tubers. Such tubers sprout poorly, while the sprouts that appear are weak and their growth is retarded.

Tuberculate scab, or oosporosis (pathogen, the fungus Oospora pustulans) attacks tubers in the soil, through lenticels and eyes, as well as mechanical injuries. Infection passes from diseased tubers to healthy ones, and oosporosis continues to develop on them during storage, being manifested in the form of dark tubercles and, with marked development, they merge but the tissue does not rot.

Among the pathogens of wet rot, the most frequently encountered are Pectobacterium species (Pect. corotovorum, Pect. phytophthorum), and infection occurs during vegetation. At the early stages of potato development, the disease is manifested in the form of a black pedicle, and then moves on the tubers. On section, they demonstrate rotting tissue with cavities in the center.

Contact fungicides and bactericides (TMTD, 80% wetting powder; cyneb, 80% wetting powder, polycarbacin, 80% wetting powder; cuprosan, 80% wetting powder; penta-thiuram, 50% wetting powder; benomyl, 50% wetting powder; tecto, 60% wetting powder, and others) have activity against some of the above-mentioned diseases and their combination.

They not only protect tubers during storage, but also partially protect them after planting (with the exception of formalin).

TMTD, 80% wetting powder: Its active element is not water miscible, but is soluble in most organic solvents. TMTD is highly stable, does not lose its activity during long-term storage, and its activity persists for more than 30 days against sensitive pathogens.

Immediately after harvesting or before loading for storage, as well as before planting in the soil, seeds should be treated with an aqueous suspension of TMTD at the rate of 2.1-2.5 kg/ton, using 70 ℓ working solution per ton tubers. LD_{50} for animals is 375-865 mg/kg. In the USSR, it is not permissible to have any residuals in foodstuffs.

Virtually all of the above-mentioned pathogens are sensitive to TMTD. It depresses the pathogens of phytophthorosis, fusariosis, rhizoctoniosis, scab and fomosis, but is not active enough against pathogenic bacteria.

Cyneb (aspor, ditex, difer, microneb, carbadin and others), 80% wetting powder: It is poorly soluble in water (up to 0.001%). It is less stable than TMTD. The zinc contained in this agent is utilized by plants as microfertilizer. It

is used for the same purposes as TMTD, but because of the presence of zinc it is active against bacterial diseases. Planting material is treated with cyneb at the same time as TMTD. It is used at the rate of 0.5-1 kg/ton, dispensing 70 ℓ/ton. Allowable residual level in potatoes is 0.6 mg/kg.

Cuprosan contains 65% copper oxychloride and 15% cyneb. LD_{50} for animals is 400 mg/kg. Allowable residual levels in potatoes, other vegetables and fruit are 5 mg/kg. Dosage is 0.25-0.5 kg/ton, with use of 70 ℓ/ton working solution. Cuprosan is active against the set of pathogens of diseases of seed potatoes, including bacterial ones. The mechanism of its action is related not only to depression of mycelium, but inhibition of sporulation in cuprosan-sensitive fungi. The copper and zinc contained in cuprosan are utilized by plants as microfertilizer.

Polycarbacin, 80% wetting powder: It contains cyneb and the polymer, ethylene thiuram disulfide in a ratio of 3:1. LD_{50} for rats is 6100 mg/kg.

It is used in the same cases as TMTD at the rate of 2.6-2.7 kg/ton. In the USSR, allowable concentration is 1 mg/kg in potatoes.

Pentachloronitrobenzene (PCNB)*, 25% wetting powder, at the rate of 6-7 kg/ton, and pentathiuram, 50% wetting powder (30% TMTD + 20% PCNB), at the rate of 2.8-3.5 kg/ton, are highly effective in the control of all types of scab during storage. Maximum allowable residual level in planting material is 1 mg/kg.

Formalin, at the rate of 30 ℓ/ton, is still used extensively (1:80 or 1:100). It depresses superficial fungal and bacterial microflora only at the time of treatment, when there is direct contact of fumes with the pathogen. Formalin does not remain on tubers, and for this reason reinfection is possible. The agent can lower sprouting of potatoes.

Relatively recently, permission has been given in our country for treating seed potato tubers with agents that have systemic action based on benzimidazole (benlate, tecto). They depress both superficial and internal infection, and they are effective in protecting tubers against diseases during storage. Healthy planting material can be obtained when tubers are treated with benlate and tecto.

Benlate, 50% wetting powder (fundosol, benomyl, arbotrin, arylate) contains as active ingredient 1-butylcarbamoyl)-2-benzimidazolecarbamic acid methyl ester. LD_{50} for rats is over 10 g/kg. Permissible residual concentration is 0.5 mg/kg. It is recommended in the form of 0.5% suspension using 70 ℓ working solution per ton tubers.

Tecto* (thiabendazole, TBC, TBZ, mertect, mycozole, etc.) contains as its active ingredient 2-/thiazolyl-4/-benzimidazole, and it was developed by the Ciba-Geigy Company. LD_{50} for animals is 3100-3850 mg/kg; 45% tecto is permitted in a dosage of 90 mℓ/ton for treatment of potato tubers before storing or before planting in the soil. Allowable residual concentration in potatoes is 0.01 mg/kg. This agent is used in many countries: England, FRG, France, Holland, Sweden, Switzerland and others. Its use is allowed in the USSR. It is effective against different forms of rot (fusariosis, fomosis)

and scab (tubercular, silvery). Tecto is inactive against bacteriosis, but because of its high activity against mycosis (dry fusariosis and others) it lowers susceptibility of tubers to bacteriosis since, in many cases, it develops as a secondary infection.

Hydrel, which retards tuber sprouting, improves integrity of potato growth regulator. It is used at the rate of 9 g (active substance) per ton of tubers. Sprouting inhibitors cause less susceptibility to potato diseases.

The efficacy of agents to preserve tubers is increased significantly if the entire system of measures developed for protecting potatoes against diseases is practiced: preventive measures, removal of diseased plants and tubers, wise use of fertilizers, raising resistant varities, adhering to crop rotation and conditions for storage of seed tubers, use of pesticides, as a preventive measure and to treat vegetating plants for eradication purposes. The dosage of agents depends on planting time, amount of planting material used and region where potatoes are grown.

Thus, our experiments, which we performed in 1982 on an experimental field of the Korenevo farm of the Scientific Research Institute of Potato Growing, to test susceptibility to phytophthorosis of Domodedovskiy variety of potatoes, revealed that when plantations were sprayed twice with 0.1% ridomil (800 ℓ/ha) there was 52% reduction in development of phytophthorosis of tops, as compared to the control (100%). The potato tubers gathered from these plots virtually failed to acquire phytophthorosis during storage. We also determined that tubers gathered from plots sprayed three times with copper chloride, 90% wetting powder, in the vegetation period were also less susceptible to phytophthorosis. In this version, incidence of disease constituted 0.5% in tubers and 55% on tops.

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CLUBROOT DAMAGE TO BE REDUCED

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 p 49

[Article by Yu. P. Antonov, senior scientific associate at Scientific Research Institute of Vegetable Growing]

[Text] Clubroot is a fungal disease (pathogen, Plasmodiophora brassicae) that causes pathological changes in roots. It strikes white, red, leaf cabbage, cauliflower and other types of cabbage, turnips, radishes, horseradish, ornamental and weed plants of the cabbage family (Cruciferae). Different sized spindle-shaped swellings develop on adventitious roots, the primary root is hypertrophied and becomes deformed. There is information to the effect that excrescences may form on stalks and petioles of leaves. Clubroot spores remain in soil for a long time, 5-7 years (over 10 years according to some data). They spread when soil is cultivated, with irrigation as well as with rain water and snow melt. The pathogen often penetrates into infected plots with infected planting material, and occasionally with manure from animals fed on clubroot-diseased plants.

Pl. brassicae penetrates into the root system at the early stage of its development and stimulates plant growth (particularly those that are markedly susceptible), secreting growth substances. Subsequently, putrefactive microorganisms settle on the formed excrescences and destroy them, as a result of which the plants are left without a root system. It has been determined that the earlier a plant is stricken, the more its productivity is diminished and the greater the probability of its death. According to the data of L. A. Sokolova and S. M. Tupenevich, the harvest from healthy seedlings planted in infected soil decreases by 38%, whereas in the case of infection already in the nursery and planting under the same conditions, it is 73% reduced. Plants can be stricken with clubroot at any stage of vegetation.

The soil is the principal carrier of infection. Raising cabbage on infected land leads to intensive accumulation of the pathogen in it: when there is severe contamination of the root system, up to 3 tons of excrescences are formed per hectare, which constitutes about 100,000 spores per gram soil.

Optimum soil acidity, at which there is intensive plant infection, is in the range of pH 5-6.5. In neutral and mildly alkaline soil, there is considerable decrease in diseased plants and degree of disease development.

The spore density plays a significant role in pathogenesis. Dissimilar concentrations of spores are needed to infect plants with clubroot on different soil (other conditions being favorable); according to the data of N. A. Naumov, there must be at least 200,000 spores per gram of composted soil and 20,000 spores on clayey soil.

Control of clubroot is a complicated process. It includes growing healthy seedlings, adhering to crop rotations, using fertilizers and resistant cultivars.

Seedlings stricken with clubroot are not suitable for planting. The soil in hothouses or nurseries must be replaced if it is infected with Pl. brassicae. Application of freshly slaked lime is recommended in cases of mildly infected soil in hothouses or nurseries before sowing seeds. Clubroot spores do not perish with such treatment, but unfavorable conditions are produced in the soil for their growth. For treatment, one takes 1-1.5 kg lime per hothouse flat [frame] or square meter of nursery. One should not apply unslaked lumps to avoid damage to plantations.

Growing cabbage seedlings in nutrient peat blocks free of clubroot spores has a good effect. It helps the seedlings take better in the field and lowers significantly damage to the root system, and also increases plant productivity. Mainly the lateral roots are infected in the nutrient-turf blocks, and this happens much later than when the seedlings are not potted.

In plots where clubroot causes loss of harvest, it is necessary to exclude crops of the Cruciferae family from the crop rotation for 4-5 years.

There is drastic decrease in harmfulness of clubroot in the case of sophisticated agriculture, since fertile soil, well-aerated and fertilized with organic and mineral fertilizers, becomes decontaminated faster from the pathogen. This is attributable to the fact that most of the clubroot spores sprout under conditions that are beneficial for plant growth and development, even in the absence of a host on which this pathogen parasitizes.

In order to reduce the harm of clubroot on very acid soil, one should apply freshly slaked lime (10-15 kg/10 m^2 with overall application, or 35-40 g per well of lime thoroughly mixed with soil with topical application). One must bear in mind that excessive lime leads to binding of some elements of plant nutrition and causes intensification of incidence of common scab of potatoes. For this reason, the specific dosage of lime for application in soil must be determined according to its acidity.

Drainage of moist areas reduces significantly clubroot invasion of cabbage. If, however, the soil is very moist, one should plant cabbage early, which retards development of the disease.

When plants are grown without use of seedlings, there is no period of "taking," and they suffer less from diseases, and at the same time the labor-consuming process of raising seedlings is eliminated.

Plant ridging, which helps form additional roots, lowers production losses due to clubroot.

After harvesting sick plants, one should remove excrescences and infected stems from them and destroy them. Before being fed to animals, diseased plants should be steamed to prevent the spread of the pathogenic fungus in manure.

It is necessary to destroy weeds in the Cruciferae family that are susceptible to clubroot in order to lower infection of soil.

The following cultivars are highly resistant to clubroot: Losinoostrovskaya 8, Moskovskaya pozdnyaya 9, Zimnyaya Gribovskaya 13, Ladozhskaya 22, Tayninskaya 11, Moskovskaya pozdnyaya 15 and others. They are stricken less with clubfoot, while formed excrescences do not decompose in soil for a long time, as a result of which the diseased roots do not rot and are functional. However, to prevent appearance and reproduction of more aggressive forms of the fungus, one should not raise these varieties on infected plots for long periods of time.

* * *

Discussion of Problems of Forecasting Number of Plant Pests and Diseases

A conference was held in Novosibirsk to discuss refinement of methods of predicting agricultural plant pests and diseases. It was attended by specilists from the Rossel'khozkhimiya [Russian Scientific Production Association for Agrochemical Services to Agriculture] Administration of Plant Protection, laboratories of diagnosis and prognosis, scientists from the All-Union Scientific Research Institute of Plant Protection, SibNIIZKhim [Siberian Scientific Research Institute of Chemical Protection?] and Biology Institute of the Siberian Department of the USSR Academy of Sciences. They summed up the achievements of diagnostic and prognostic laboratories at the Orenburg, Chelyabinsk, Kemerovo, Omsk, Tomsk, Altay, Irkutsk, Chita, Amur, Sakhalin, Tuva, Yakut plant protection stations and zonal Ural, East Siberia and Far East regions, with definition of their tasks for the current year. Attention of the participants was focused mainly on the need for testing and introducing new methods of forecasting, keeping records of pests and diseases, and reporting the dates for controlling them.

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REPORTING AND PLANNING SESSION OF ALL-UNION INSTITUTE OF PLANT PROTECTION

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 58-60

[Article by G.A. Nasedkina, scientific secretary of VIZR]

[Text] The annual report and plan session was held at VIZR [All-Union Order of Red Banner of Labor Scientific Research Institute for Protection of Plants], which summed up the performance of this institute over the past 3 years of the 11th Five-Year Plan with regard to fulfillment of the special-target combined scientific and technical program, "Conception and development of production and use of effective chemical and biological agents for protection of animals and plants against pests, diseases and weeds that would be safe to man and the environment."

The report of the director of VIZR, K. V. Novozhilov, corresponding member of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin], noted that the institute's staff coped well in 1983 with the planned volume of research and rendered much practical assistance to the farms. In the spring, several of the institute's laboratories, the Baltic affiliate, stations and bases conducted much organizational and methodological work dealing with high-quality decontamination of seeds from smut diseases.

Promptly prepared forecasts of distribution of pests both in the USSR as a whole and separately for the RSFSR and Nonchernozem Belt had a substantial influence on planning and organization of work to protect plants.

With reference to completed projects contained in the combined scientific and technical program. K. V. Novozhilov commented on some of them. The staff of the institute determined the economic thresholds of harmfulness of 105 pests of the main agricultural crops. Generalized proposals on this score were examined by the Scientific and Technical Council of the USSR Ministry of Agriculture and were rated good. Their introduction will generally improve phytosanitary measures, cause savings of agents for plant protection and manpower. "At present," the speaker stressed, "when the stage of their practical assimilation is beginning, it is extremely important for all stations and bases to become involved in zonal evaluation of economic thresholds of harmfulness and make their contribution to the further definition of these indicators. This is particularly important since they do not as yet take

into consideration all ecological, ethological distinctions of development of harmful species in different zones, yet this is necessary to set integral thresholds of harmfulness."

The staff of VIZR has done much work to assess the phytosanitary condition of wheat and barley plantations in crop rotations differing in proportion of grain crops. Interestingly, in the European part, where there is prevalence of winter crops, up to 50-60% grain crops is allowed, whereas in the Asian part, where mainly spring crops are grown, it could be increased to 70-80%. Experience has shown convincingly that when the proportion of grain crops is increased, there is significant increase in damage done by root rot, the oat nematode, grain sawflies and leaf beetles.

It is planned to expand investigations dealing with phytosanitary assessment of energy-conserving and field-protecting technologies of soil cultivation and, first of all, their effect on root rot.

A special interlaboratory team has been formed at the institute, and it investigates the principal pathogens of diseases causing spoilage of farm products; they developed procedures for growing and postharvesting preparation for storage of crops, biophysical methods of "input" quality control. Constant phytosanitary inspection was implemented for batches of potatoes, vegetables and fruit stacked for storage. The scientific research was based on practical work dealing with inspection and analysis of product samples at bases in Leningrad Oblast. In 1983, more than 130,000 tons of potatoes, 10,000 tons of carrots, about 9000 tons of cabbage, 3000 tons of edible beets and other products were analyzed and inspected; recommendations have been offered to improve preservation of their quality. It is planned to continue theoretical research on this problem, in particularly, to investigate pathological physiology of different products stored, development of high-speed methods of detecting potato diseases, including a faster method of detecting latent injuries to tubers.

K. V. Novozhilov then discussed aerovisual studies and remote methods of keeping records and gathering base information, with its subsequent processing on computers.

The speaker noted, "In West Kazakhstan, at the Kushumskiy Sovkhoz in Ural Oblast, the VIZR staff, together with the Kazakh Scientific Research Institute of Plant Protection, determined the extent of distribution of susliks by the aerovisual method. As a result, there was a 4-point rating scale for aerial observation estimates of suslik populations on virgin land, on the basis of proportions between areas occupied by different associations of vegetation. In 1983, this method was used on all land of the Kushumskiy Sovkhoz, which constitutes 75,000 ha."

Together with the VNIIPANKh GA [expansion unknown], a method was developed for aerial estimation of infestation of grain crops with cereal leaf beetle larvae, which is based on the use of aerial photos as a reference. In Krasnodar Kray, aerial inspection of winter wheat plantations by this method has been made over an area of 48,000 ha. As a result of this joint work, there was publication of "Methodological Instructions for Development of

Airborne Visual Determination of Phytosanitary Status of Fields and Plantations." A "Methodological Guide on Information Support of Forcasts and Reports of Omnivorous Pests and Diseases of Grain Crops and Potatoes," is waiting to be published, and so is a manual on methods of forecasting the beet webworm population, use of which would reduce to about 1/10th the labor involved to gather base information. However, there are still claims as to the reliability of forecasts prepared by VIZR. While we recognize the difficulty involved in preparing them for dynamic species of pests, we should still strive to further define all elements of the forecast, gain deeper knowledge of ecological patterns of mass reproduction of deleterious species and their migrations.

"The current trends in development of agriculture (specialization, concentration)," the speaker noted, "have made it necessary to expand studies on immunity of plants to diseases and pests. Studies were continued on race composition and detection of genes of virulence of the pathogens of the most important diseases in different parts of the country. As a result of analysis of the pathogen population structure, sources of resistance were found. Thus, 320 specimens of wheat were evaluated for verticular resistance to brown rust [Puccinia triticina]. Determination was made of cultivars containing the resistance genes. Among the 1540 specimens of oats and over 200 of barley, immune ones were found, as well as those highly resistant to crown and dwarf rust. About 30 out of 86 potato cultivar samples were found to combine horizontal and race-specific resistance."

To validate territorial division of resistance donors, 453 clones of the pathogen of brown rust were tested on isogenous lines. A total of 134 strains of the pathogen of fusariose wilt of thin-fiber cotton were studied for pathogenicity and virulence. All of these materials were forwarded to appropriate breeding centers and the State Commission for Varietal Testing of the USSR Ministry of Agriculture.

Studies have continued on immunological barriers of plants for harmful organisms, as well as mechanism of their respones.

New immunologically significant antibiotic barriers, in particular, sulfur-containing glycosides, glucoalkaloids, flavonoids and other physiologically active substances have been found in some species of pests of the cabbage and onion, in the cornborer, frit fly and bollworm, as a result of formation of compensatory and adaptive reactions.

The important role of endogenous and exogenous effect of the host plant on the varietal level was established, as an inductor of microevolutionary processes in pests, which is a substantial factor in selection among phytophage populations.

Studies dealing with immunity are being conducted by the institute in close creative contact with institutions of the USSR Academy of Sciences and Union republics, sectorial and zonal scientific research institutions. On the basis of methodical work and with the direct involvement of institute staff members, corn hybrids resistant to a set of pests, a potato cultivar insusceptible to the Colorado beetle and two hybrids of white cabbage with increased resistance

to cabbage flies, clubroot and bacteriosis were found, which are suitable for long-term storage in the winter; work is being completed on development of a highly productive cucumber hybrid with combined resistance to the spider mite and powdery mildew. In 1984, a cycle of studies is being conducted on the mechanisms of plant resistance to pests, on the basis of anatomical, morphological and biochemical distinctions: determination was made of the significance of microstructure of wheat endosperm to its resistance to sucking pests; making an evaluation of heterogeneity and specificity of gliadin of wheat cultivars differing in reaction to chinchbugs; investigation of genetics of virulence of pathogens of reticulate helminthosporiosis of barley, with use of protoplasts.

Unfortunately, development of this branch of phytopathology is still being retarded by the insufficient level of research on genetics of both phyto- and entomo-immunity, cell engineering (not to mention gene engineering). There is inadequate development of immunological studies of fodder crops, root rot of cereals, viral, bacterial and nematode diseases.

Use of protein markers is already yielding results in breeding bread wheat for resistance to rust and powdery mildew fungi. It was found possible to label foreign genetic material for grain proteins in substituted wheat-couch, wheat-rye and wheat-Aegilops lines resistant to rust and powdery mildew fungi. Methodological instructions have been developed for breeders in the nation on use of protein markers in assessing wheat for resistance to brown rust.

Each year, there are monthly seminars at the VIZR, which are on a high methodological level, for immunologists of breeding centers and other institutions, and the attendance already numbers 100 people.

In studies of the biological method, attention was focused mainly on problems related to development of our domestic resources of useful organisms--entomophages, entomopathogens and antagonists. The natural resources of our country are tremendous: more than 50,000 species of entomophages, several thousand species of microorganisms and quite a few useful forms among other categories. Unfortunately, only a few dozen species are being studied as yet. For this reason, the VIZR specialists are developing a basically new direction--use of naturally occurring populations of entomophages and entomopathogens that depress pests directly in the field.

The mechanism of natural regulation of entomophages and entomopathogens is working well on grain, legume, vegetable crops, as well as cotton, sugar beets and others. This is of special significance, since it permits making substantial adjustments to the volume of extermination measures performed expressly on field crops that occupy the largest areas, which is consistent with ecological principles of utilizing nature, social, economic and environment-protecting measures. The VIZR scientists have proved that naturally occurring entomophages and pathogens can, in a number of regions, depress significantly the harmful shield bug (egg parasites, Phasiidae, leaf beetles), cereal aphids (Coccinellidae, Syrphidae and others), rustic shoulder-knot moth (virus of granulosis), pea aphids (entomophthorosis), cabbage pests (Microsporidia, entomophages) and other pests, which inflict damage also

in promising systems of agriculture. Criteria have been developed for evaluation of levels of efficacy of entomophages and entomopathogens, which are used extensively in the practice of plant protection. Consideration is given to useful organisms referable to different systematic groups: insects, viruses, fungi, protozoans, etc.

Competence in all work related to evaluation of the role of useful organisms is particularly important to the solution of this problem. For this reason, agronomists and specialists are trained in methods of keeping records and analyzing entomophages and entomopathogens right in the field (visiting seminars) and at seminars of the USSR Exhibition of Achievements of the National Economy; these matters are discussed extensively in the journal, ZASHCHITA RASTENIY [Plant Protection], and methodological aids are being published.

Mechanized mass production of the most effective entomophages is an extremely important means of developing the natural entomophage resources. On the example of the biological factory for Trichogramma production, which was established at VIZR in the past, presently similar lines are being developed with the help of the Agropribor [Agricultural Instruments] Association, for breeding Chrysopa, Cryptolemus and certain others. This required development of research on synthesis of nutrient media and ecology of entomophages. "We would like to have VNIIBMZR [All-Union Scientific Research Institute of Biomethod of Plant Protection], the Agropribor Scientific Production Association and other institutions cooperate more closely," stated K. V. Novozhilov.

A search is continuing for means of improving the productivity of existing biological factors by refining their design and emphasizing the biological distinctions of the insects that are raised. For example, treatment of grain with belkozin causes virtually complete grain consumption by moth caterpillars with concurrent almost 1.5-fold increase in yield of product of an improved quality.

An integrated method of protecting cabbage was developed at the VIZR, which is based on resistant cultivars, keeping records of entomophages and entomopathogens, release of Trichogramma and other entomophages, and use of biologicals.

Studies are in progress of the biomethod in protected ground: search for new entomophages (Cycloneda, Far East Chrysopa, Micromus angulatus), biologicals are being tested (trichodermin, boverin, verticillin), tomatoes are being inoculated on a broader scale with attenuated strains of tobacco mosaic virus against viral diseases (in Leningrad Oblast, such inoculation was performed on an area of 300,000 m^2 in 1983).

Many investigations were pursued on new groups of pesticides. In 1983, 122 agents underwent state testing, including 17 insecticides, 14 biologicals, 9 nematocides, 2 soil fungicides, 22 fungicides, 16 seed disinfectants and 35 herbicides.

A total of 57 products were recommended to industry, including 13 insecticides, 9 biologicals, 4 nematocides, 14 herbicides, 13 fungicides and 4 disinfectants.

The following agents have been proposed: fungicides--botran for control of fruit rot during storage, alyett and serocin for rape, rovral and sumilex for control of sunflower rot, topsin-M for control of soybean blight; disinfectants--atrocit, baytan-universal and keminar (vitavax analogue) for control of smut diseases and root rot, rovral TS on rice against seed mold, root rot and pericullariosis; herbicides--fusilade for onions and beets, raundap for spring use on the fields to be planted with rape, vitox on beets, utal for autumn application in rape fields and summer application on fruit crops and grapes; insecticides--anometrin N for cotton against the bollworm and vegetables in protected ground against whiteflies, heterophos (7.5% granulated) for corn and potatoes against wireworms, zolon on rape against a set of pests and on soybeans against the soybean moth and others.

An assortment of chemicals has been developed to control soybean pests, and it includes synthetic pyrethroids (ripcord and sherpa), selecron and phosalone. Upgraded technologies have been tested for use of pesticides on the main agricultural crops.

In regions where virgin land is being developed, it was shown that the Soviet agent, aphos, is promising for control of wheat smut. Spraying with bayleton and the new fungicide, tilt, was found to be effective in the control of a set of plant infections. Introduction of a system of measures in Salskiy Rayon of Rostov Oblast and, particularly, at the Gigant Grain Growing Sovkhoz helped protect plantations against damage by the shield bug and preserve a harvest of 21,500 tons worth more than 1.5 million rubles.

The technology was refined for use of herbicides to control resistant weed species on grain crops, which is based on using mixtures of agents and varietal resistance of plants. Specific recommendations have been made to industry on the use of the new herbicides.

Studies have been made of new, selective acaricides in the group of unsaturated organophosphorus compounds of heterocyclic synthesis by the INOES [typo for INEOS?--Institute of Heteroorganic Compounds], USSR Academy of Sciences, and agents developed by other institutes were studied. An extensive production check has been completed of the system of alternating pesticides for control of resistant populations of pests in South Tajikistan. Insecticides, miticides of seven chemical groups and microbiological agents were used in rotation. A VIZR base was established in Parkharskiy Rayon to introduce this system.

Studies were continued of juvenoids and attractants for different purposes and prepared forms of previously screened juvenoids synthesized by the Institute of Chemistry, Estonian Academy of Sciences. When tested against the glasshouse whitefly, they demonstrated an effect similar to a juvenoid produced in America--minex. High efficacy was established in suppressing naturally occurring populations of the large white cabbage butterfly and cabbage moth.

Together with the GNBS [expansion unknown] of the USSR Academy of Sciences, the VIZR scientists performed a zonal experiment to determine the efficacy of new sex pheromones (paper tapes for disorientation of the codling moth). Field

tests demonstrated that it is possible to replace the attractant, denacil, with a cheaper agent, acenol. However, expansion of such work is being retarded by insufficient industrial production of hormone preparations, pheromones, adhesive and traps. K. V. Novozhilov suggested that there be intensification of contact between the institute and chemists who are developing the technology for producing these agents. The institute's staff have developed base data for preparing recommendations to upgrade organization of airborne chemical spraying in the Soyuzsel'khozkhimiya [All-Union Scientific Production Association for Agrochemical Services to Agriculture] system.

The standards set, together with co-executor institutes, for expenditures referable to use of ground-based machines, pesticides and levels of preserved harvest have been coordinated with the USSR Gosplan and approved by the USSR Ministry of Agriculture. The method of planning work to protect plants on different levels has been approved by the Scientific and Technical Council of the USSR Ministry of Agriculture.

In conclusion, K. V. Novozhilov defined the institute's tasks for 1984, called upon the staff to mobilize their efforts to fulfill the plan of practical measures for implementation of the Food Program.

The paper of S. P. Starostin, deputy director of VIZR, summed up the achievements of the institute regarding introduction and dissemination of information about scientific advances. In 1983, the institute and its geographic network introduced 30 scientific developments. The economic efficiency, as confirmed by agricultural organizations, constituted 9.8 million rubles.

Prof I. Ya. Polyakov, Prof A. Ye. Chumakov, Prof V. N. Burov and others reported on progress of research pertaining to different tasks in the special integrated scientific and technical program.

The session outlined the basic directions of work at VIZR in 1984-1985.

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EXHIBITION OF PRODUCTION EQUIPMENT FOR AGRICULTURE, 29 MAY-7 JUNE 1984, MOSCOW

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 84 pp 61-64

[Article by Yu. N. Neypert]

[Text] This was the fourth such exhibition in the capital of our homeland. The first three had indicated the increasing interest in showing the latest advances in the area of agricultural production equipment. Sel'khoztekhnika-66 [1966 exhibit of agricultural production equipment], attracted 18,000 visitors, and export-import deals amounting to 250 million rubles were made there. There were more than 100,000 people at Sel'khoztekhnika-72, and contracts amounting to 209 million rubles were concluded. Sel'khoztekhnika-78 was attended by 100,000 specialists, while the business totaled 700 million rubles.

The general impression gained from the fourth exhibition is the appreciable increase in scientific and technical sophistication of machinery, equipment, materials and technologies offered to farmers by machine- and instrument-makers, chemical and other enterprises, a change from development and production of different machinery and agents to aggregates providing for mechanization of all processes in agricultural production.

As was the case at the preceding exhibitions, the largest exhibit was that of the Soviet Union, in the preparation of which 240 enterprises and organizations of 19 ministries and agencies participated. More than 1000 exhibits in 20 different sections characterized the advances in Soviet tractor-building and agricultural machine building, progress in science and technology of mechanization of the agroindustrial complex. These achievements are the result of implementation of the agrarian policy of the party, which is based on the course of intensification of agricultural production and comprehensive mechanization of manual labor.

At the present time, there are 2.9 million tractors, 741,000 grain-harvesting combines and other machines in operation in our country's agriculture. In this decade, 3,740,000-3,780,000 tractors, 1,170,000 grain-harvesting combines and other machines totaling 67-70 billion rubles will be delivered to agriculture; the fixed production capital of agriculture will increase by 1.5 times, while energy consumption will increase by more than 1.6 times. The equipment exhibited here gave an idea, not only about the present level of mechanization of agriculture, but basic directions of its development, as

planned in the USSR Food Program. We are referring to development of more powerful tractors and complex machinery for them, replacement of obsolete basic models of plows, sowing machines, spraying machines, reapers and machines to apply fertilizers with more refined models. Due consideration was given to the fact that such progressive technologies and forms of organization of labor as industrial farming, work on the basis of collective contracts, establishment of mechanized complexes and detachments.

The equipment that is being developed and designed must provide for a 1.5-1.8-fold increase in labor productivity, increased service life and reduction of specific materials consumption. Among the exhibited machines, one could see the new grain-harvesting combine, Don, which is high powered, equipped with a comfortable cabin, electronic device for automatic control, the family of energy-intensive Belarus' tractors, the set of self-propelled machines for feed procurement, various combined units that make it possible to perform several agrotechnical operations in one pass, technological-transport diesel trains, KAZ-4540 and Ural-5557, with a load capacity of 11 and 14 tons, machines for land reclamation, forestry, application of fertilizers and pesticides, equipment for repair of machinery, diagnosis and maintenance.

The exhibition also provided a full idea about the collaboration of the Soviet Union with other states in the design and production of machinery, mutually advantageous trade in farm equipment, exchange of experience and ideas. There was a special section reserved for the Agromash international society, which coordinates development, production and distribution of equipment for mechanization in vegetable growing, horticulture and viticulture. Its participants include the People's Republic of Bulgaria, Hungarian People's Republic, GDR, Polish People's Republic, USSR and CSSR. At the present time 44 types of machinery are being developed.

A number of machines were and are being developed on the basis of bilateral and multilateral agreements. Each socialist nation specializes in development and delivery of a specific type of equipment. Scientific and technical collaboration has enabled CEMA member nations to come close to solving new problems, in particular, the design of radio-controlled tractors, electric-hydraulic systems for control and automatic monitoring of condition of tractors and farm machinery.

The items exhibited were indicative of the growing popularity of Soviet machinery abroad. It is used in more than 70 countries, under the most varied environmental and climate conditions. There is a particularly high demand for our energy-intensive tractors and trailers for them; they can be encountered on the fields of Hungary and GDR, France and Canada, the United States and Australia. Soviet machines for spreading fertilizers are operating in France and Scandinavian countries, KKN-2,25 cultivators in Belgium, BDN-1,3 harrows in Nigeria. Iraq has purchased more than 1000 grain-harvesting combines and Egypt has bought 500. The Traktoroeksport foreign trade association is helping farmers of other countries in the training of machine operators and personnel for repair and operation of equipment.

The exhibit of spraying machines, equipment used for disinfection, fueling units, various devices for protection of plants and different attachments

was quite impressive. The Soviet exhibit included both new equipment and machinery already in series production, for example, the OUN-4 small suspension sprayer, OP-2000 orchard-field attachment, OPSh-15 rod-type for industrial technologies, the semi-automatic PSSh-5 disinfectant applicator (developed to replace the obsolete PSSh-3), cotton sprayer OVKh-28, automatic sprayer for hothouses ATOS-0.5, the mobile OEP-60 machine to treat small plots, etc.

The Hungarian machine builders brought an extensive set of machinery for plant protection. The Kertitox family of spraying machines is known not only in Hungary, but GDR and other countries; some models of this family were developed through international collaboration. The Kertitox is put out with different working parts (horizontal and vertical rods, fans), tanks (1000 to 4000 ℓ), and attachments, depending on specific operating conditions. The Humotox-S disinfection machine is intended for decontaminating potato tubers against diseases, a process that is also becoming mandatory in our farms. The output of Humotox is 10-12 tons/h. Our farmers are well-acquainted with the automated Mobitox disinfectant units, and the kolkhozes and sovkhozes where seed treatment centers have been organized are particularly happy to acquire them. A new modification of this item, the Mobitox-Cyclomate, is characterized by greater output (25 tons/h); it has a sealed cabin with filtered air, from which the operator controls all processes of seed disinfection. Continuous operation equipment for the preparation of working solutions of pesticides has been produced on a modern level, as well as for loading them in ground-based and airborne Pemix-1003 sprayers. The mixer is equipped with a computer for precise control of technological processes. It is installed either on a tractor trailer or body of a motor vehicle, and for this reason can be readily delivered anywhere that work is being done. The 2000-ℓ tank is made of plastic.

Computers have also appeared in the machinery for plant protection in other countries. For example, the computer on the sprayer of the French firm (Caruelle), permits setting programs for a number of treatment parameters, in particular, dispensation of liquid, pressure in the system and size of drops. A radar sensor corrects the outlay of fluid per unit area, keeping it constant regardless of speed of tractor movement. The sprayers are put out with spray bars of different lengths (16-24 m) and tank sizes (2500-4000 ℓ), as ordered by the buyer.

The visitors were also able to see sprayers from other countries--Italy, Finland, Denmark and Poland. In essence, these are rod-type units with a high degree of automation of control of work processes, with use of rust-resistant materials and, first of all plastics, and possibility of rapid replacement during treatment of one type of sprayer with another. We were impressed by the high quality of execution of the machinery, but accordingly their cost is also high.

The Austrian firm, (Khayd), exhibited a general-purpose seed disinfecting unit. It is put out on order in several standard sizes. The GKI Firm (France) demonstrated the technology for treating stored grain against pests. A special compact sprayer was developed, which is operated by a

compressor. A plant-installed cannister with insecticide serves as the tank. Spraying is done when the seeds are transported, in a flow.

The design and use of modern equipment in agriculture would be inconceivable without an integrated approach to mechanization of different processes. As we have already mentioned, this was fully demonstrated at the exhibition: virtually all enterprises and firms did not exhibit individual machines, but sets of them linked to performance of a given technological chain.

For this reason, it is not by chance that there was interest in pesticides, the specifications for which have increased in recent years expressly from the standpoint of their conformity to modern technologies and, first of all, industrial farming of the most important agricultural crops. The exhibits provided a complete answer to questions such as extent of effects of chemicals on increasing profitability of production, lowering labor, energy and material expenditures, improving product quality. Specialists were interested in the possibility of applying a pesticide in the cycle of other field work, mixed with other agents or fertilizers, need for rapid application, sensitivity of future crops in rotation, hazard to man and the environment.

The Hungarian herbicide, alirox, for example, can be well "inserted" into the industrial technology of growing corn, relieving farmers of repeated mechanical cultivation to eradicate weeds. Moreover, its efficacy depends little on soil moisture, which is particularly important to arid zones. At a special symposium scheduled for the period of the international exhibition, the Hungarian specialists told their Soviet colleagues about a new herbicide, glialka. In spite of the fact that this agent is not selective, a place has been found for it in technologies for raising several crops; treatment is performed before sowing or after harvesting. It is also used during the vegetation period, but with protective shields, so that the solution would not get on the cultivated plant.

Among the preparations of the GDR, emphasis was laid on the growth regulators, Kamposan M and uyetin. In the German Democratic Republic, this agent is applied by personnel of agrochemical centers, of which there are 250. Each year, half of all the winter crop plantations are treated with these regulators, and the increment in harvest constitutes 1.5-10 q/ha. Permission has been granted for use of Kamposan M on winter rye in the USSR. In the GDR, uyetin is recommended to accelerate tomato ripening.

The Monsanto Company illustrated extensively the efficacy of herbicides in a system of minimal treatment of soil. Corn is planted in ridges, which permits faster maturation of the crop, and there are fewer presowing and postsowing soil treatments. The herbicides are applied concurrently with other operations, for example, together with sowing, for which purpose the sowing machine is outfitted with a sprayer. On corn, best results have been obtained with lasso, either in pure form or mixed with atrazine, on sunflower plants with lasso mixed with prometryn or linuron, on soybeans with lasso mixed with prometry, linuron or sencor.

A mixture of lasso and banvel or other agents is used to control Cyperaceae. Herbicide spraying is also done on fallow land. Use of pesticides is tied in

with the specific distinctions and time of performance of agrotechnical operations, with minimal tilling of soil; an optimum set of machines has been proposed for cultivating specific crops, in particulr, the Gardi rod-type sprayer. Estimates have been made of the economic advantages of the offered technology: 45% less fuel and 32% less labor as a result of fewer tractor passes and combining operations.

The herbicides put out by the Stauffer Firm are intended for industrial technologies and specific methods of use. There has been distinct specification of conditions for using eradican on corn, eptam on sugar beets, ordram on rice, etc.; a method has been proposed for applying the agents with irrigation water (herbigation). Some new herbicides displayed at the Moscow exhibit are just as technological. One of them, prinap, is used on sugar beets after they have sprouted. A 45% concentrate of emulsion contains 36% ronit and 9% betanal, it is effective against the same weeds as betanal, but is less expensive.

Another new herbicide, reyser, is proposed for presprouting use on potatoes, cotton, sunflowers and carrots. It is good as a supplement to treflan, since it destroys the weed species that are resistant to treflan. It is put out in the form of 25% emulsion concentrate and is in the category of agents with low toxicity.

Ordram has been improved. Its latest modification (ordram-extra) is notable for the fact that it contains an extender, which retards destruction of the herbicide by bacteria, and it retains its destructive action on growing weeds for a longer time, making it unnecessary to repeat chemical treatment in a number of cases.

The firm also reported on a new technology for using eradican on corn, concurrently with application of anhydrous ammonia into soil. This procedure is particularly promising in a system of minimal working of the soil. The unit consists of a tractor, harrow (or cultivator) and a tank with anhydrous ammonia attached behind the harrow. There is a herbicide tank (factory installation) on the harrow, as well as a pump, unit to mix the fertilizer and herbicide. The injectors connected to the sprayer with flexible hose are installed behind the harrow disks or cultivator teeth. The mixture is sprayed when the working unit is at a depth of 10 cm, so that there is no need for additional covering of the agent. Water is also unnecessary, since the anhydrous ammonia (which is dispensed at the rate of 140 kg/ha) serves as a sort of filler for the herbicide.

The Union Carbide Company is known by the farms in our country mainly for the insecticide, sevin. Almost ready for use is another agent, temik. It has a combined effect on nematodes, mites, many insect species and is put out in granular form, for the spreading of which applicators developed by this firm are proposed. Detailed information was furnished at the exhibition about the use of 10% granulated temik on sugar beets, potatoes, cotton and tobacco. The agent is being tested in the USSR on several crops.

An innovation of the firm is the insecticide, larvin, for protection of leguminous crops and, first of all, soybeans. It has intestinal and contact action, and it does not affect useful insects. It is used in a low dosage

(0.3-0.5 kg/ha for active ingredient). A visible trace is left after a field is treated, so that one can check the quality of the treatment.

One of the largest chemical concerns in the world, Ciba-Geigy, furnishes to agriculture agents for the most diverse purposes and numbering tens of names. Major research is in progress on toxicology, refinement of technology of chemical control, improving safety of treatments and economy. The specialists of this firm maintain, in particular, that with the increasing use of the chemical method there is full justification of leaving unused ruts on grain fields for passage of a spraying machine. This would permit prompt performance of necessary protective treatments in conjunction with the industrial technology for recovering a programmed harvest and prevent the adverse effect of harmful organisms. The partial loss of sowing area is more than compensated by the preserved production and appreciably heavier spikes on plants along the edges, which have had plenty of room to develop.

The firm exhibited a wide assortment of pesticides. Some of them are well-known. Let us mention, in particular, the herbicide, dual, against grain pests, which is used on many crops both in pure form and mixed with other herbicides: the general-purpose herbicide for corn, primextru, the fungicide ridomil and insecticide basudin. Several new pesticides were developed in the last few years. The fungicide, tecto, is proposed for treating potato tubers against rhizoctoniosis. The spraying equipment is installed on a sorting machine. The working unit is a revolving disk, which permits a high density of tuber coverage with a film of undiluted agent with ultra-minimal spraying. The protective effect persists until seedlings appear. The treatment is performed both in the spring and fall. In the latter case, there is increased preservation of seed tubers in the winter.

Another disinfectant of the Ciba-Geigy Firm, apron, is intended for control of Peronospora diseases in sunflowers, sugar beets, corn, wheat, leguminous and other crops. It is used either alone or mixed with other fungicides and insecticides. The technology has been described for using various forms of apron.

The insecticide, promet, prevents seedlings against many pests, including wireworms, fleas, pygmy mangold beetles, weevils, aphids, thrips and others, when applied to seeds of spiked grain, sugar beets, corn, cotton and other crops by the method of seed coating or spraying.

Damfin is also an insecticide, but it is intended to protect grain against storage pests.

The Dow Company informed exhibition visitors about the new herbicides, starane and nelpon. The former is recommended to eradicate grain crops (spring and winter) in doses of 125-200 g/ha active ingredient, as well as corn (200-300 g); it is not toxic for warm-blooded animals and effective against broad-leaved weeds, including those resistant to 2,4-D; grain crops are resistant to it, even when used in high doses. Starane can be used in mixture with other herbicides to broaden the spectrum of action. Nelpon is a new Dow development. It is a postgermination herbicide for grain crops; good results are obtained when it is mixed with atrazine and mineral oil. This firm is continuing to refine the technology for using nelpon.

Flex is a new postgermination herbicide for soybeans produced by ICI; it is used at the 2-3 leaf phase of weeds (broad-leaved weeds that are encountered the most often in soybean fields). It is not toxic to warm-blooded animals and soybeans are resistant to it, even when used in doses several times greater than recommended. The firm refined another herbicide, fusilade (against cereal grasses, postgermination, for weeding broad-leaf crops), and is offering it under the name of fusilade-super. There are two zoocides, ratak (containing the anticoagulant difenacoum) and clerat (brodifacoum), which are highly effective against many rodents that are pests in warehouses, farms and fields. To assure safety, it is recommended that the bait be placed in short pipes, tin cans, etc.

The results of research done by this firm is development of an original sprayer, the Electrodyne. A special disposable package of pesticide, under the name of bazzel (using cimbush, pirimor and fusilade as active ingredient) is inserted into a small hand unit on a long handle. As they pass through a special nozzle, the drops of this agent acquire an electric charge and are, so to speak, "attracted" to the surface of treated plants. This not only enhances the protective effect, but reduces significantly loss and erosion of sprayed pesticide.

The Japanese firm, Mitsubishi, demonstrated several new promising pesticides of the Cyanamid and Rohm & Haas firms. The herbicide, blazer, is a highly effective contact agent for soybeans and depresses broad-leaf weeds. It has speedy action, within 3-4 h, and even rain soon after application does not prevent it. Soybeans are resistant to it at all stages of development. Counter, an insecticide and nematocide, is used on sugar beets, corn, potatoes, cotton, tobacco, cabbage and other crops. Its advantage is a broad spectrum of action (in addition to nematodes, against wireworms, leaf beetles, aphids, thrips, weevils, etc.) and low rate of use (less than 0.5 kg active ingredient per hectare).

The exhibit of the Schering Firm was more extensive, as compared to prior exhibits in Moscow, since another "pesticide" company, FBC, became part of the firm recently. In addition to the well-known postgermination Schering herbicide, betanal, there is now another one, nortron, which destroys cereal grass weeds and some dicotyledonous plants. It can be used in combination with betanal. The insecticide and miticide, mitac, is intended for protection of fruit, cotton and can add to the list of acaricides that are alternated in order to prevent development of resistance to chemicals in mites. Apollo is another miticide for fruit and vineyards. It destroys not only the mobile stages of mites, but their eggs. The list of Schering fungicides includes previcur, sportac, vinicur and others.

The Degesch Firm specializes in equipment and pesticides for fumigation of plant products and sowing material. There are designs for and production of vacuum chambers and sterilizers, the size and construction of which are made to order for customers; they also train technical personnel. The fumigants they produce include methylbromide, phostoxin, calcian and magtoxin. It also produces agents for control of plant diseases and products in storage.

The French firm, Rhone-Poulenc collaborates actively with Soviet enterprises and institutions; many of its chemicals are used in agriculture, and among

them, phosalone is in first place. At the exhibit, information was also furnished about a number of other agents. There were some herbicides from the ioxynil and bromoxynil group, in particular, totril for onions and garlic, buctril for flax and corn. The herbicide, modaun, was developed on the basis of biphenox, for sunflowers, rice and spiked grain. It is used before germination against dicotyledon weeds, including those resistant to 2,4-D. The herbicide for soybeans, tackle (acifluorfen) is recommended after application of certain soil agents, and then both cereal grass and dicotyledon weeds are destroyed.

The fungicides and disinfectants of the Bayer firm, bayleton and baytan are acquiring increasing use in many countries, including the USSR. The former is effective against powdery mildew and wheat rust, diseases of fruit and vegetables. It is used in low doses (can be mixed with herbicides, growth regulators, fertilizers and insecticides). The fungicide has both preventive and eradicating action. Baytan is a mercury-free systemic disinfectant for grain crop seeds, which protects plants against fungus diseases, including powdery smut of wheat and barley. It is put out in several forms: 7.5 and 15% baytan contains the indicated percentage of triademenol; baytan-combi includes another active agent, imazaline; baytan-universal contains fuberidazol in addition to the two mentioned. The mixtures, of course, have a broader range of action.

The insecticide, volaston, is not toxic for warm-blooded animals but is effective against a number of pests (wireworms, moths, maybeetles, Colorado beetles, etc.). It is put out in different forms for treatment of seeds--granules, emulsion concentrate and preparation for UMO [expansion unknown].

The Shell Company considers fastak to be the best of all of its previously developed insecticides; it is a synthetic pyrethroid, the active ingredient of which is alphametrin. The dosage used is a few grams per hectare, and it destroys many species of pests (Lepidoptera, beetles, bugs, aphids, Coccidae). Fastak is virtually safe for bees. It is put out in the form of emulsion concentrates (5, 10, 20%) and rinsing powder (5%). A form is being developed for UMO.

There are quite a few other enterprises, organizations and firms that acquainted visitors to the exhibition with agents, technologies and mechanized application methods. The Iskra, Sumitomo and Hoechst firms prepared comprehensive exhibits. There were symposiums on the most interesting problems of chemical protection of plants, meetings of specialists, screening of movies illustrating the technology for using different agents, including some made in our country.

Specialists are familiar with the periodical, PLANT PROTECTION COURIER, which is published in Russian by Bayer. It contains information about new agents, their testing and refinement of technology. We were told about an analogous publication of the Shell Company, entitled SPAN, by one of its editors, B. N. FOX. SPAN is published three times a year in a printing of 12,000 copies; it contains not only departmental information, but articles on general issues, strategy and tactics of chemical protection of plants, economics of pesticide use and environmental protection.

The Sel'khoztekhnika-84 exhibition was visited not only by residents of Moscow, but scientists, specialists from the quarantine and plant protection service, representatives of the Sel'khozkhimiya Association [Scientific Production Association for Agrochemical Services to Agriculture], kolkhozes and sovkhozes in many Union republics and research centers of our country. Exchange of experience, information and the established contacts will, no doubt, be instrumental in further progress in upgrading protection of harvests against pests, diseases and weeds.

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RADIOLOGY IN SELECTION

Moscow TASS in English 20 Nov 84

[Text] The world's first collection of so-called induced mutants of subtropical crops has been created in the USSR, a TASS correspondent was told at the agricultural Radiology Research Institute. The mutants have been obtained through exposing the genetic appratus of plants to x-ray and gamma radiation. They have been selected for breeding new grades of tea and citrus crops.

Soviet scientists have made a considerable contribution to developing theoretical and practical foundations of mutation selection, which is an effective method for speedily obtaining the materials necessary for selection. They have to their credit one in each seven farm crops bred this way.

More than 30 mutant varieties of wheat, barley, buckwheat, beans, sunflower, grapes and other crops are grown on a commercial scale in the USSR. The "Novosibirskaya-67" wheat holds a special place among them. It is characterized by an exceptionally good crop, which is highly important for harvesting, and is undemanding as regards moisture. In addition its strong stalk can withstand heavy winds and rains. The wheat, which is notable for high bakery qualities, now occupies 2.5 million hectares.

High yield "aelita" and "lada" buckwheat varieties have been obtained by means of radiation mutagenesis. "Agdash-3" cotton, bred by the same method, is sown in increasingly larger areas in Azerbaijan. This method has made it possible to create and sow new varieties of soybean, beans and barely in Georgia. A new collection of mutants of subtropical crops will make it possible to speed up the cultivation of high-yield varieties of tea and citrus crops.

CSO: 1840:161

BIOCHEMISTRY

ARTIFICIAL ENKEPHALINS FOR ANALGESIA

Vilnius SOVETSKAYA LITVA in Russian 19 Sep 84 p 4

[Text] Scientists of the Latvian Academy of Sciences' Institute of Organic Synthesis have developed new chemical counterparts of natural substances which suppress sensations of pain.

"Protein compounds -- enkephalins -- which we have synthesized are modeled on analgetic substances that are produced in the body," explained G. Chipens, member of the Latvian Academy of Sciences. "Among the artificial counterparts are some which are tens of thousands of times more powerful than morphine -- a preparation obtained from the opium poppy. Unlike natural compounds with a life of fractions of a minute, the artificial enkephalins act for about an hour, however."

Experiments are continuing in the institute's laboratories; the scientists wish to eliminate certain undesirable properties which are characteristic of natural enkephalins. Unlike conventional medical preparations, future ones must not give rise to tolerance in the organism or adversely affect the functioning of the heart and the respiratory organs. The day when the analgetics developed by the scientists are turned over to medical personnel is not far off.

FTD/SNAP
CSO: 1840/053

BIONICS

TECHNICAL VISION FOR ROBOTS

Dushanbe TASS in English 17 Nov 84

[Text] A new invention by Soviet scientists who have copied the structure of a human eye will help replace a human telescope-watching astronomer with a robot. It will be possible to provide technical vision not only for robot-astronomers but also for their industrial fellow robots.

So far, an artificial eye with dimensions close to those of a human eye discerns only black-and-white images. But already the second model of the eye is to perceive colors as well. Specialists from the Institute of Astrophysics of the Tajikistan Academy of Sciences and Tajik University have had to go through hundreds of materials and substances capable of not only substituting for living matter but also of keeping its properties to refract and reflect light. Eventually they found polymers which are suited for the role of the coat of the eye, lens, and vitreous body. The retina has been replaced with a bundle of the finest glass filaments through which light rays get onto photomultipliers. They can be positioned outside the artificial eye. The main thing is to prevent great losses in the light guide.

The authors of the invention are now busy designing a new device analogous to the eye of the dolphin. They want to create a device which is capable of seeing underwater as well as in the air.

CSO: 1840/160-E

MICROBIOLOGICAL METHOD FOR TREATING CHEMICAL PLANT SEWAGE

Moscow PRAVDA in Russian 19 Sep 84 p 6

[Article by V. Tolmachev, Alma Ata]

[Text] Poisonous wastes become harmless after passing through a metal grating covered by a glass fabric. What is this -- a new kind of sewage-treatment installation? Yes, but one without machinery. It is biology that serves people. The sewage is purified by bacteria.

"Eight years ago, a chemical plant asked for help in finding a means of combating certain toxic wastes of a rubber production unit," said Roza Murzagaliyevna Aliyeva, senior science associate of the Kazakh Academy of Sciences' Institute of Microbiology and Virology. "For a long time, our personnel have been studying microorganisms' interaction with their environment and looking for bacteria which would live on harmful wastes.

"As regards the chemical plant's request, we studied more than 300 types of bacteria. Not one of them possessed the requisite properties, however. Work was pursued simultaneously at the plant itself, where approximately another 200 microorganisms were isolated. Laboratory tests showed that bacteria in shops with toxic effluents possessed the highest biological activity. The experiments continued with these bacteria.

"Each microorganism's 'appetite' was carefully tested. The doses in which it was capable of absorbing toxic agents that go to waste were ascertained in the process. Many bacteria lost their 'appetite' almost at once.

"And only two or three types were in excellent health in tenfold or even twentyfold concentrations. These microorganisms were then transferred from laboratory flasks to a glass fabric which was installed in the stream of the plant's sewage channel. Results were seen at once; the toxic substances ceased to affect the environment.

"We are now investigating the possibility of transferring the properties of individual microorganisms to other ones. After all, only a few types of bacteria are capable of actively breaking down harmful wastes at present. But if hundreds of microorganisms acquire this property, sewage treatment will become still more effective and large-scale."

FTD/SNAP
CSO; 1840/053

BRIEFS

SOVIET-FINNISH MEDICAL COOPERATION--(Armenpress)--The sixth meeting of a Soviet-Finnish working group on cooperation in medical technology and pharmacology was opened in Yerevan. The participants of its proceedings include, from the Soviet side, representatives of the State Committee for Science and Technology and of the USSR ministries of foreign trade, medical industry and health, and from the Finnish side, representatives of pharmacological companies and companies producing medical equipment. The meeting participants were welcomed by Armenian SSR minister of health, Armenian SSR Academy of Sciences Corresponding Member E. Gabriyelyan. "Soviet-Finnish scientific-technical cooperation in medical technology and pharmacology, and in public health and medical science, is a major contribution to strengthening friendly relations between our countries," said USSR Deputy Minister of Health N. Shmakov. Matti Ruokola [transliteration], general director of Finland's Main Medical Administration, spoke at the meeting, noting that cooperation between the two countries in medicine and in other spheres is developing fruitfully. [Text] [Yerevan KOMMUNIST in Russian 2 Nov 84 p 4] 11004

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SANITARY PRESERVATION OF KURA RIVER

Moscow GIGIYENA I SANITARIYA in Russian No 6, Jun 84 (manuscript received 2 Dec 83) p 68

[Article by V. Yu. Akhundov, K. F. Akhundov and T. V. Grekalova, Scientific Research Institute of Virology, Microbiology and Hygiene imeni G. M. Musabekov, Azerbaijan SSR Ministry of Health, Baku]

[Text] The Kura is the largest river, not only in Azerbaijan, but in the entire Transcaucasus. Its sources are found at a height of 2740 meters. Overall length of the river is 1515 km; it flows throughout the territory of the Azerbaijan SSR for 906 km.

In terms of its water system, the Kura belongs to the group of rivers with spring flooding and autumn flooding. It is fed by a combination of thaw waters, snow and ice (52%) underground waters (30%), spring-summer and autumn rains (18%). Average milti-year flow of the river is the basic description of its water content and the starting base for water management calculations. The average annual flow rate for many years of the city of Shamkhor is 265 m^3/s; the city of Yevlakh, 320 m^3/s; the city of Zardov, 358 m^3/s; the city of Sabirabad, 557 m^3/s; and the city of Sal'yana, 590 m^3/s. The Kura plays a large role in the national economy of the republic. A basic fresh reservoir, it serves as the source of household drinking-water procurement for numerous populated points in a centralized and decentralized system, including a number of major cities: Baku, Sumgait, Mingechaur, Zardob, Ali-Bayramly, Sal'yany and Neftechala. This river is also very important for the natural production of the most valuable commercial fish of the Southern Caspian, possesses significant water power resources and is used extensively for irrigation.

Hygiene studies on the sanitary condition and quality of the water of the Kura were done at water supply districts of the centralized household drinking water procurement of the largest cities of the republic: Shamkhor, Mingechaur, Yevlakh, Zardob, Ali-Bayramly, Sal'yany and Neftechala.

One of the principal factors affecting Kura water quality is the sanitary condition of the population areas. Studies that have been done have made it possible to determine that the sanitary situation of a large portion of

cities and population points adjacent to the Kura that were studied is unsatisfactory. Household-domestic and industrial waste waters do not undergo sufficient purification and decontamination.

The mineral composition of the water of the Kura has changed significantly in recent years, due to the rapid development of industry and agriculture of the republic and the expansion of land reclamation operations (leaching of the extremely saline soil of the Mugano-Mil'skiy Steppe and the discharge of drainage waters into the Kura), especially in the river's lower course, in the region of Ali-Bayramly, Sal'yany and Neftechala.

According to our multi-year studies in the region of Shamkhor, salt content in the water of the Kura from 1971-1972 was basically in the range of 253.6-716 mg/l. The amount of sulfates did not exceed 233.4 mg/l; chlorides varied from 4 to 48 mg/l.

The Kura was characterized by average mineralization within the boundaries of the city of Mingechaur from 1954-1982. The total of ions was basically 236-543.2 mg/l. But in 1977-1978, the maximum total of ions increased to 746.9 mg/l, and the level of basic chemical ingredients, sulfates and chlorides increased correspondingly.

Studies of the water of the Kura in the range of the city of Yevlakh showed that in this region a tendency toward an increase in the mineral composition of this river's water has been noted, particularly since 1977. The maximum value of total ions did not exceed 492 mg/l prior to 1976; in the period from 1977-1982 it grew to 817.8 mg/l. In the region of the city of Zardob, total mineralization of the Kura water from 1973-1982 was significantly higher than in Yevlakh. Total ions in the water of the Kura in this area varied from 502.9 to 1078 mg/l; the maximum was noted only once (in 1980). Sulfate and chloride concentration increased correspondingly during this period (to 300.9 and 180 mg/l). In the range of the cities of Ali-Bayramly, Sal'yany and Neftechala, total mineralization of the Kura water was even higher; the most significant increase in this value was noted from 1978-1982. A higher level of sulfates and chlorides was also established for this period.

Total hardness of the Kura water in the aforementioned areas varies significantly and increases corresponding to an increase in total mineralization downstream.

In regions of the cities studied, Kura water contained petroleum products, phenol and synthetic surfactants, but the amount of the latter basically did not exceed hygienic norms.

Thus, results of multi-year studies (1954-1982) bear witness to an unsatisfactory sanitary condition of a large portion of cities and population points gravitating to the Kura. The improperly organized collection, removal and utilization of solid and liquid waste products promotes the deterioration of a number of indices characterizing the quality of water of this river.

In spite of the enactment of various measures for preservation of the Kura, the disposal of insufficiently purified household-personal and industrial

waste waters from a number of Azerbaijan cities continues, contributing to pollution of the river. On the whole, the water quality of the Kura meets requirements of GOST [All-Union State Standard] 17.1.3.03-77, "Nature Conservation. The Hydrosphere. Rules for the Sampling and Analysis of the Quality of Sources of the Centralized Household Drinking Water Supply."

At the present time in the republic, in connection with the realization of a general plan for comprehensive use of the water resources of the Kura Basin, extensive measures are being enacted for its preservation from contamination.

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CSO: 1840/1550

ENGINEERING PSYCHOLOGY CONFERENCE

Moscow LENINGRADSKAYA PRAVDA in Russian 10 Oct 84

[Text] The creation of conditions for all-around creative development of the personality and for maintaining health and occupational longevity during the intensification of scientific-technical progress is linked by Soviet scientists and specialists with the broad introduction of results of engineering-psychology research. New technology, particularly various types of control stations, is being designed with the uniqueness of human thought processes taken into account, on the basis of psychological analysis of human managerial activity, which permits machines to be 'suited' to their users, to the maximum extent. These facts were cited at the Sixth All-Union Conference on Engineering Psychology, which opened yesterday in Leningrad.

Scientists and specialists in the field of engineering psychology from leading USSR research centers have gathered at this conference, which was organized by the Institute of Psychology of the USSR Academy of Sciences, the academy's All-Union Society of Psychologists, and Leningrad University. In the course of plenary and section meetings, these scientists and specialists are to examine a wide range of questions of engineering-psychology theory and methodology which are connected with problems of vocational orientation and training of various types of specialists, and human-computer interaction.

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CSO: 1840/053

LASER APPLICATION AT ACUPUNCTURE SITES

Moscow TASS in Russian 14 Sep 84

[Text] A low-intensity laser beam can cope well with the task of relieving tension in the working day and relieving fatigue, considers Nikoly Yevtikhiyev, Corresponding Member of the USSR Academy of Sciences.

In an interview with a TASS correspondent, he said that the "Orion" medical instrument, created in the Moscow Institute of Radio Technology, Electronics and Automation, utilizes a low-power helium-neon laser. It is a compact, portable instrument with single-channel or multi-channel fiber-optics, by which red light acts on a person's acupuncture points.

Various laser beams can be used by means of this instrument to act on 10 biologically-active points. But the greatest effect is achieved by acting on several at once.

In Yevtikhiyev's opinion, the laser technology of bio-stimulation could well replace acupuncture. The laser beam has a specific effect which is not produced by acupuncture, suntan or massage. Whereas an acupuncture session lasts about an hour, the laser beam treatment takes only 10-15 minutes. It is also pain-free and antiseptic.

Research in clinics in Moscow, Kiev, Kalinin and Vinnitsa shows that laser bio-stimulation speeds up convalescence. There is less risk of repeat infection.

The laser beam can be used to treat neurological, cardiovascular, bronch 1, allergy and skin diseases.

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UDC 616.72-002.77-085.281.8:547.283.2

USE OF DIMETHYL SULFOXIDE (DMSO) TO TREAT FLEXURAL CONTRACTURES IN PATIENTS WITH RHEUMATOID ARTHRITIS

Moscow TERAPEVTICHESKIY ARKHIV in Russian No 9, Sep 84 (manuscript received 18 Feb 84) pp 128-129

[Article by Yu. V. Murav'yev and A. P. Alyab'yeva, All-Union Center for the Study of Antirheumatic Drugs, and Institute of Rheumatology, USSR Academy of Medical Sciences, Moscow]

[Text] Flexural contractures in rheumatoid arthritis patients is a frequent and hard-to-treat complication which restricts joint function and frequently disables the patient.

Traditional treatment methods (intra-articular injection of hydrocortisone, phonophoresis and electrophoresis of different drugs) are very often found to be ineffective, especially in relation to long-lasting contractures. Therefore we employed a fundamentally new approach to treating this serious complication: prescription of high concentrations of dimethyl sulfoxide (dimeksid, DMSO) as a topical dressing on afflicted joints.

Owing to its unique capability for penetrating through all biological membranes, DMSO is widely employed in medical practice.

Up until recently, a 50 percent DMSO concentration was thought to be optimum, providing the lowest percentage of side effects. But 60 and 70 percent DMSO solutions have recently been employed more frequently in suppurative surgery.

Having tested 60 and 70 percent DMSO solutions in the treatment of flexural contractures of elbow joints in rheumatoid arthritis patients, we achieved a more noticeable effect than with application of 50 percent solution--the angle of extension was increased by 8-10 percent, but the expressiveness and persistence of the effect cannot be thought of as being satisfactory.

This encouraged us to increase the DMSO concentration. We decided to try using undiluted DMSO, even though this could elicit an undesirable complication in the form of skin irritation at the point of application of the drug. To reduce the risk we "habituated" the skin of the patients to DMSO.

Undiluted DMSO was used to treat 18 patients with proven rheumatoid arthritis characterized by degree II-III activity and by stage II-III roentgenological changes, among which flexural contractures were progressing in 20 elbow joints

despite current treatment (including local treatment by steroids). The control group consisted of 11 rheumatoid arthritis patients with flexural contractures in 17 elbow joints and with similar clinical, roentgenological and laboratory data. There were no noticeable differences in the sex, age or time of existence of flexural contractures between patients in the two groups (the time of presence of contractures was from 1 to 5 years). Patients without signs of bony ankylosis of elbow joints were selected for treatment. Background therapy was not changed and steroids were not injected into elbow joints during the treatment period (see table).

Clinical Characteristics of Patients with Rheumatoid Arthritis Complicated by Flexural Contraction of Elbow Joints

Группа (1)	Число больных (2)	Пол (3)		Возраст, годы (6)		Давность заболевания РА, годы (7)		Степень активности (11)				Стадия по рентгенологическим данным (12)				Степень функциональной недостаточности (13)			Число леченых суставов (14)		Давность контрактуры, годы (15)	
		ж. (4)	м. (5)	20—30	31—60	до 10 (8)	более 10 (9)	I	II	III	IV	I	II	III	IV	I	II	III	1	2	1—3	4—5
1-я	18	3	15	4	14	7	11	2	10	4	2	0	2	12	4	5	11	2	6	4	15	5
2-я	11	2	9	3	8	4	7	0	8	2	1	0	7	3	1	3	6	2	8	3	9	2

Note: The highest indicators in group 1 were 1/360 for the latex test and 1/1,024 for the Rose-Waaler test, while the lowest indicators were 1/20 and 1/64 respectively; rheumatoid arthritis was seronegative in 3 patients. In group 2 the highest indicators were 1/360 for the latex test and 1/924 for the Rose-Waaler test, while the lowest were 1/32 and 1/32 respectively; rheumatoid arthritis was seronegative in 2 patients.

Key:

1. Group
2. Number of patients
3. Sex
4. Female
5. Male
6. Age, years
7. Duration of rheumatoid arthritis, years
8. Up to 10
9. Over 10
11. Degree of activity
12. Roentgenological stage
13. Degree of functional insufficiency
14. Number of treated joints
15. Duration of contracture, years

Following a skin test with 50 percent DMSO solution, five or six 30-40 minute applications of the solution were made (once a day). On days 6 and 7 since the beginning of treatment, undiluted DMSO was applied to the skin over the afflicted joint. When a burning sensation or reddening of the skin over the joint appeared (these phenomena were usually noted 7-10 minutes after application of DMSO), a thin layer of hydrocortisone ointment was applied.

DMSO was applied in this fashion every other day for a total of four or five times. An increase in the angle of extension by 10-15° was usually noted after the very first application, and an increase by 20-30° was observed by the end of treatment. The angle of extension increased by 12-30° for 13 elbow joints, by 8-10° for five and by 5° for one. The effect persisted for 3 years. Between 1980, when treatment was initiated, and the present these patients never visited us due to recurrence of contractures.

Patients of the control group were subjected to 12 electrophoresis procedures using lyophilized hyaluronidase (from bull testes) in a conventional course of treatment. An increase in the angle of extension was noted after five or six procedures, and it attained a maximum by the end of treatment. In one elbow joint mobility increased by 18°, it increased by 12° in another, it increased by 2-5° in 12 joints, and there was no effect in two cases. The angle of extension of elbow joints in patients treated with DMSO increased by an average of 14.1±1.4°, while electrophoretic treatment with hyaluronidase resulted in an average of a 4.3±1.3° ($P<0.001$) increase in the angle of extension.

Thus preliminary evaluation of the obtained data shows that the method we propose for DMSO treatment of flexural contractures of elbow joints in the presence of rheumatoid arthritis offers significant advantages. This permits us to recommend this method for wider use.

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UDC 61(07.07)

IMPROVEMENT IN METHODOLOGICAL AND IDEOLOGICAL LEVEL OF TEACHING MEDICAL DISCIPLINES

Kiev VRACHEBNOYE DELO in Russian No 10, Oct 84 pp 1-4

[Article by N. I. Pas'ko and G. A. Rubtsov, Department of Scientific Communism and Political Economics, Kiev Medical Institute: "Tasks in Further Improving the Methodological and Ideological Level of Teaching the Medical Disciplines"]

[Text] The April (1984) Plenum of the CPSU Central Committee indicated the need for further improving the level of educational and training processes in all the segments of public education. The comprehensive program for improving the Soviet school is aimed toward the solution of this global problem, as are the "Basic Directions for Reform of the General Education and Professional School", ratified by the April (1984) Plenum of the CPSU Central Committee and the First Session of the USSR Supreme Soviet, eleventh convocation. In a speech presented at this Plenum, CPSU Central Committee Secretary General and Chairman of the Presidium of the USSR Supreme Soviet, comrade K. U. Chernenko, stressed that today "...the entire educational process must become the bearer of ideological content to a much greater degree," and that in no instance may we "...lower the scientific level of education."[1]

The scientific level of instruction is defined primarily by the party affinity, by the methodological and ideological directionality, and by the uncompromising struggle against bourgeois ideology and its variations--anticommunism, reformism and revisionism.

The methodological questions of instruction are always the center of attention for scientists of various specialties. They are particularly current now, when the concept of K. Marx on the creation of a unified science of man is being practically implemented. Anticipating the principle unity of all science in the future, he wrote: "In the future, natural science will include the science of man in the same measure as the science of man will include natural science: this will be one science."[2]

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1 "Materialy Plenuma Tsentral'nogo Komiteta KPSS 10 aprelya 1984 goda," [Materials of the Plenum of the CPSU Central Committee, 10 April 1984], Moscow: Politizdat, 1984, p 18.

2 Marx, K. and Engels, F. "Iz rannikh proizvedeniy," [From Early Works], Moscow: Politizdat, 1956, p 596.

On the basis of this position, F. Engels united all the sciences into a single system, in which the different spheres of knowledge reflect the real ties in the material world. This is extremely important at the current stage, when a multitude of aspects of structural levels of material is being studied.

According to the classification of the sciences given by F. Engels, medicine is on the boundary between the natural and social sciences. In studying man, it applies the laws of natural and social science. The work of medical men may be successful if their knowledge of the laws of development of nature, society and thought is deep. Medicine views man as a biosocial being. Therefore, in the process of treatment the physician must establish not only the biological factors of the illness, but also clarify the patient's social living conditions. A knowledge of philosophy, political economics, scientific communism, social psychology and the other social sciences will be of great help to medical workers in this regard.

The rapid development of modern natural and medical sciences urgently requires an increase in the methodological and methodical level of instruction at VUZes and in secondary educational institutions. It is no accident that at the 26th CPSU Congress, and later at the June (1983) and April (1984) Plenums of the CPSU Central Committee the Law on Reform of the General Education and Professional School adopted by the first session of the USSR Supreme Soviet, eleventh convocation, presented the tasks for further improving the forms of education and training of specialists in all professions for our country's national economy.

The basis for improving the methodological level of instruction in medicine is the integration of the educational process, the unification of efforts by all departments and by the entire instructional staff. This may be achieved with the condition that every pedagog has a thorough knowledge of not only his own subject, but also a mastery of the dialectic method of education, that he maintain firm positions of materialistic ideology and that he defend them with communist conviction. Special medical departments must constantly illuminate the methodological problems of medicine and public health and must expose the principles, laws and categories of dialectic and historical materialism, political economics and scientific communism. This will improve the methodological level of lectures, eliminate duplication, and facilitate the supplementation of educational programs with the latest achievements of medical science, the formulation of firm communist convictions, and the creation of a new type of socialist personality.

Improving the educational process is one of the means of elevating the level of ideological training work in the VUZ. As we know, education and moral upbringing are interrelated. In the process of education, the student receives not only the sum of scientific knowledge and masters the necessary skills. He also formulates a world outlook, ideological-political convictions and moral ideals since, as was pointed out at the April (1984) Plenum of the CPSU Central Committee, each new generation must ascend to a higher level of education and overall culture, professional training and civil activity.

The main role in confirming a dialectical-materialistic outlook in the student belongs to the social sciences. In teaching the social sciences, as comrade K. U. Chernenko noted, one must always be guided by revolutionary theory and skillfully apply the tested Marxist-Leninist methodology of the scientific search. Obviously, new facts may lead to the necessity of augmenting or clarifying the formulated views. However, there are truths which are not subject to review, problems which have been singularly resolved long ago. And, remaining on the footing of science, we cannot "forget" about the basic principles of dialectical materialism.

Medicine, which comes to know man as no other science, requires a broad general philosophical approach to the study of his life activity. Philosophy fulfills both an ideological and a methodological function. Under the methodological level of the educational process we refer to the capacity of the instructor for formulating a communist ideology in the students, of arming them with the dialectical method of studying and generalizing scientific results, and of instilling in them the skills for creative application of Marxist-Leninist teachings in their practical activity.

A high methodological and ideological level in the instruction of special medical disciplines presupposes the application of the classical works on Marxism-Leninism and documents of the Communist Party and the Soviet government which are of primary importance for higher education, medical science and the practice of public health.

The teaching of special sciences must be done according to the following directions: a) the development and improvement of a materialistic ideology in the student based on natural science material; b) the development of the ability to independently apply Marxist-Leninist methodology in solving problems in medicine and public health; c) instilling in the students the qualities of the Soviet physician and their mastery of the ethical norms, psychological attitudes, and spiritual values of a developed socialist society.

In order to elevate the methodological level of instruction in the medical sciences, it is also necessary to equip the students with modern research methods. This refers primarily to the philosophical method as being the general method of cognition, as well as the general biological and general medical--specific methods used in the given branch of medicine.

The introduction of achievements in scientific-technical progress at the current stage presents a number of new social problems in medicine, leads to its technical retooling, to a search for new means and methods of preventing illness and treating patients, and to a change in the character of the physician's activity. The future doctor must also know what determines high labor productivity and its peculiarities. He must be versed in questions of ecology and must be capable of solving new problems in the sphere of hygiene of labor, everyday life, nutrition, etc.

A high ideological and methodological level of instruction consists of knowing how to convincingly criticize the idealistic and metaphysical concepts in current bourgeois medicine and public health theory. In teaching the general

theoretical medical and biological disciplines, it is expedient to expose vitalism and neovitalism, teleology, monocausalism, conditionalism, constitutionalism, and the biologization theories of man. Clinical practitioners must criticize Freudism and neofreudism, psychosomatics, and mechanistic interpretations of the pathological practice more specifically. In the sphere of the hygienic sciences, emphasis should be placed on criticism of the theory of "social deadaptation," "diseases of civilization," social Darwinism, neo-Malthusianism, racism, "social sellism", etc.

In the methodological directionality of teaching the cross-section disciplines, it is important to consider the peculiarities of the subject and the level of preparation of the students. In this case, simplification and declaration should not be allowed, but rather the questions of medicine must be tied in with the philosophy of Marxism-Leninism. This connection is drawn by two means. First, certain categories and laws of dialectical materialism are illustrated by facts from medicine. This method is not effective enough. The second method, which is more complex and also more effective, consists of solving some specific medical problem with the aid of philosophical positions. In illuminating the theoretical questions of science, it is necessary to stress its philosophical and social significance. This requires problem-solving education, whose principles are being ever more widely introduced into the process of teaching various sciences in the higher and secondary medical education institutions.

The comprehensive armament of the students with Marxist-Leninist methodology of analysis and cognition of reality is the primary task in teaching the social, natural and medical disciplines. Only as a result of the assimilation of these basics in complex is it possible to prepare a highly trained specialist who is ideologically mature, cultured, and who has mastered the profession of physician--a person who thinks creatively and is active and responsible in the collective and in society. These are the specific qualities which every graduate of a medical education institution must possess.

The requirements for the personality of a physician have significantly increased at the current stage. Aside from the effective application of professional skills in the process of making a diagnosis, the physician must delve also into the "forbidden" zones of human life. He must be a good psychologist in order to predispose the patient to a frank discussion. All this places a huge responsibility for human life on the work of the physician.

The decisions of the 26th CPSU Congress and subsequent Plenums of the party Central Committee illuminated the current problems of public education in our country. The solution of these problems will facilitate the improved activity of higher and secondary education and communist upbringing of the youth. Highly trained instructors and well-known scientists work in the educational institutions, and they are constantly raising the methodological and methodical level of teaching the social and special disciplines.

The Communist Party and the Soviet government are giving particular attention to formulating methodological instruction and communist convictions in the youth. This is explained primarily by the fact that the students have great prestige with people their own age. Thanks to their various contacts, they

influence all the age categories of the youth. Secondly, in the near future the graduates of the educational institutions will become managers of collectives and educators of the masses. Therefore, the primary task of the medical educational institution is to train such a person as a Soviet physician who would embody the true humanism of the medical profession.

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ROLE OF TEACHING DEONTOLOGY TO THERAPEUTISTS IN INSTITUTES FOR ADVANCED TRAINING OF PHYSICIANS

Kiev VRACHEBNOYE DELO in Russian No 10, Oct 84 (manuscript received 9 Apr 84) pp 120-121

[Article by Professor Ye. V. Andrushchenko, chairman of the Therapy Department; Docent O. S. Davidenko, chairman of philosophy course at the Kiev Institute for Advancing Training of Physicians; Ye. A. Krasovskaya and G. F. Glukhovskaya: "The Role of Teaching Deontology to Therapeutists in Institute for Advanced Training of Physicians"]

[Text] The Resolution of the CPSU Central Committee and the USSR Council of Ministers entitled "On Measures for Further Improving Public Health" (1977) outlined the specific tasks for development of public health under conditions of socialism. In 1982 the CPSU Central Committee and the USSR Council of Ministers adopted the resolution entitled "On Additional Measures for Improving Protection of the Public Health."

Within the complex of tasks developed by the party and the government, a leading place belongs to the moral upbringing of workers in public health: "To intensify work on moral upbringing of the medical cadres, to increase their responsibility for the fulfillment of their professional and service duty, for the quality and culture of rendering medical aid to the population, and to decisively curb infractions of the oath taken by physicians of the Soviet Union and manifestation of an inattentive and uncaring attitude toward patients."[1]

The moral training of medical personnel, the formulation of an active life position by the civilian doctor and the molding of a social activist is becoming ever more important. This idea is the main theme in the Resolution of the CPSU Central Committee entitled "On the Further Improvement of Ideological and Moral Upbringing Work" (1979) and in the "Physician's Oath of the Soviet Union", ratified in 1971. Extensive work is being performed on the ethical-psychological and deontological preparation of medical personnel. In 1974 the honorary title of "USSR People's Physician" was established.

The increased interest in the moral upbringing of public health workers is dictated by a number of serious reasons. First of all, the social value of

[1] PRAVDA, 26 August 1982.

public health has grown irrepressibly, both the economic and moral humanistic. Moreover, our country's public health system covers huge numbers of people with various types of services. We also cannot overlook the important fact that under conditions of developed socialism the cultural and moral level of the population has grown immeasurably. Today's patient, as a rule, is a person with high social status and a well-developed sense of self-respect.

Scientific-technical progress has a significant influence on moral requirements within the public health system. The high scientific-technical provision in the work of medical personnel presents a new slant to the question of doctor-patient relationship. The degree of risk in the process of diagnosis and treatment of the patient increases, problems of psychical and particularly somatic pathology arise, all of which complicate the solution to the requirement "not to do harm". A contradiction has developed between the persistent search for means to preserve the health and life of the patient and the requirement of ultimate care to see that the patient is not harmed or that the development of the illness is not accelerated.

In light of the decisions in the resolutions of the party and the government in the sphere of public health, one of the most important tasks is the further improvement in the quality of work by medical institutions, the improvement in the moral upbringing of doctors and the formulation of a communist ideology, high moral qualities and civil responsibility for fulfillment of their duty.

In connection with this, questions of deontology have attracted the close attention of the medical community. Deontology is called upon to instill in the Soviet physician high moral qualities based on Marxist-Leninist theory. In the higher medical school the teaching of deontology is a significant competent part. In connection with this we must point out the continuity of teaching deontology in medical institutes and institutes for advanced training of physicians.

With the introduction of new laboratory-instrument research methods, the volume of information about the patient is increased and the time for talking with him for the purpose of finding out the individual peculiarities in the personality of the patient, with all his concerns, fears and hopes, is reduced.

Our work was based upon the teaching experience in the Therapy Department of the 2nd Kiev Institute for Advanced Training of Physicians, at which over 5,000 physician therapeutists underwent training. Along with improvement of knowledge on therapy, great attention was given to questions of deontology.

Questions of deontology are included in all the functioning sections within the system of advanced training of physicians in the field of internal illnesses. The development of these sections facilitates the increased effectiveness of the education-training process. Among these sections is educational, methodological, moral-training and scientific-research work. Educational work is done on the basis of the standardized program ratified by the USSR Ministry of Health, which contains problems, themes and elements. Certain themes, as well as elements, are devoted to questions of deontology in studying individual nosological forms of illnesses. Thus, the standardized program meets the requirements set for various contingents of audiences: physicians

in urban and rural medical sectors, shop associations, section heads, etc. The basics of physician's ethics are reviewed as a component part of Marxist-Leninist ideology, which is closely tied with the standards of communist upbringing. Questions of professional duty, honor and conscience of the physician are examined.

In further formulation of physician's thought, particular attention is given to the physical methods of study. Remembering the call of the best representatives of our country's medicine not to become carried away with "technicism" and not to overestimate the results of instrumental research methods, the student-physicians develop the need and the desire to be closer to their patients. It is most expedient to illuminate questions of deontology directly in patient examination, to analyze the problems of "doctor and patient", "doctor and patient's relatives," "doctor and medical personnel", etc., and to stress the need for implementing the principle of "treating not the illness, but the patient."

The methodological developments compiled on the basis of the standardized program are constantly being improved by means of studying literary sources, information sheets, letters and recommendations from the USSR and UkSSR Ministries of Health. Proper attention is being given to questions of deontology, to the art of conversing with patients, to knowing how to correctly understand and evaluate the internal world of the patient, i.e., to all the qualities which a doctor must have.

Ideological training work consists of formulating a Marxist-Leninist outlook by means of improving the moral training of the doctors. The distinguishing peculiarity of this work is the instillment of a sense of physician's duty and responsibility to each patient, and to society as a whole. Thus, the institutes for advanded training of physicians achieve an improvement not only in the work-related, but also in the ethical level of training of the practicing physician.

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SOVIET LAW

Kiev VRACHEBNOYE DELO in Russian No 10, Oct 84 pp 125-126

[Review by I. A. Kontsevich of book "Sovetskoye pravo" [Soviet Law] by Yu. D. Sergeyev, Kiev, Vishcha shkola, 1984 248 p]

[Text] In our country the right to protection of human health is assured by the USSR Constitution. It is for this reason that cases of improper fulfillment of professional duty, and particularly professional transgressions by medical personnal and any infractions of socialist law are intolerable. Such actions bring significant harm to the patient, as well as to the public health system.

An important role in the prevention of professional and service-related transgression of the law among future public health workers--physicians and pharmacists--belongs to the level of their legal knowledge and the degree of their conviction of the need for precise and conscious adherence to the legal standards governing physician's activity.

The course in Soviet law as a mandatory instructional discipline and an integrated component part of the general professional training of physicians as introduced in the 1976/77 school year in medical VUZes will be of great significance in this regard. The textbook by Docent Yu. D. Sergeyev (chief instructor of the course in Soviet Law, Donets Medical Institute) entitled "Soviet Law" was written in accordance with the instructional program ratified by the USSR Ministry of Public Health.

The first section deals with the basic positions of Marxist-Leninist teaching about the state and law, their origins and essence. It explains the functions of the Soviet socialist state, the role and significance of Soviet law in the realization of the CPSU politics and in a developed socialist society. It also analyzes the relations of the most important social standards--law and morals--and gives clear definitions of socialist legal order and jurisprudence.

The second and third sections are devoted to questions of state and administrative law. A rather complete and yet compact examination is given here of the leading positions of the USSR Constitution (Basic Law), of the Leninist

principles of organization and functioning of the organs of the Soviet state, and of the role and structure of the organs of jurisprudence and the procurator's office in the USSR. With the aid of an illustrated scheme, the author illuminates the structure of the organs and the legal questions of public health management in the USSR and the UkSSR, as well as the legal order of reviewing proposals, declarations and complaints by citizens.

The section entitled "Soviet Civil Law," despite its considerable length, is written in accordance with the effective instructional program of the course. It presents descriptions of subjects and objects of civil law, types of legal personages, the concepts of representation and power of attorney, agreements and claims prescriptions. Questions of laws of ownership, state insurance, patents, and responsibilities arising as a result of doing injury, etc., are examined. We must stress that even this seemingly "neutral" section which is not directly related to medicine, is written by the author with consideration for the future physician's specialty. This is noted also in the illumination of legal order, certification of citizens to be incapable or to have limited capacity, formulation of powers of attorney to treatment institutions, conclusion of agreements for capital construction and examination of questions of the participation and role of the VKK [physician's consultation commission] of treatment institutions in allocating isolated living quarters to citizens who require them for health reasons and substantiating housing privileges granted to certain categories of medical personnel. It is also noted in the analysis of the mandatory conditions under which civil-legal responsibility of the wrong-doer arises (for example, in cases of malpractice) etc. The important question of legal protection of the environment in the USSR is illuminated as applicable to medical activity (especially future sanitation physicians).

In the sixth section, which deals with questions of family law, the young students, including foreign students studying in medical VUZes, will find information on the legal order for concluding marriages, for determining the citizenship of children, as well as information on the personal and property relations between spouses, parents, children, etc.

Considerable attention--one-fifth of the volume of the entire textbook--is given to Soviet labor law. Here such vital questions are presented in detail as the order of concluding a socialist labor agreement, hiring, transfer to another job, and the basis for and order of abrogating a labor agreement. The necessary information for future doctors and pharmacists is contained in paragraphs 5 and 6 of chapter 2, which discusses the rights and responsibilities of young specialists, as well as the specifics of legal regulation of the work activity of medical personnel (seniority laws for doctors who have not worked in their profession for more than 3 years, holding more than one position, assistantships, etc.).

In illuminating questions dealing with the work time of medical personnel, standard norms are presented for physician's work load per hour of work. Reasons are presented for reduction of work time duration for certain categories of medical workers, and concepts of on-call time and overtime are discussed. Further, legal measures for strengthening socialist labor

and the order of resolving labor disputes are examined. A chapter devoted to questions of state social insurance concludes this section. It describes the concepts of continuous and medical labor service, the principles of pension provision in the USSR, and the legal order of payments for temporary work disability, pregnancy and childbirth. All the basic statutes of Soviet labor legislation are examined with consideration for the specifics of regulation of the labor of doctors and pharmacists, and all institutes of labor legislation--with consideration for the activity of the various public health institutions.

The eighth section of the textbook entitled "Soviet Criminal Law" is of particular interest. At the beginning of this section, the author briefly deals with the general portion of criminal law and describes the concepts of a crime, its composition, types and purposes of criminal punishment, as well as the circumstances excluding social danger of the act. Compulsory measures of a medical character are examined more closely in this chapter. The next chapter gives a rather successful presentation of the structure of the criminal code (using examples of UkSSR legislation) and examines the basic types of crimes.

In the third chapter of this section, the author examines in great detail and with deep understanding of the questions, the substance of such crimes as non-rendering of medical aid to a patient by medical personnel, illegal abortion, illegal practice, breaking laws on combatting epidemics, as well as dealing with narcotic substances. In the next chapter, which is devoted to work-related crimes in medical and pharmaceutical activity, the author gives an overall description of such crimes and presents a clear delineation of official and non-official persons. He also examines the content of crimes listed in this group: misuse of authority or service position, exceeding authority or service commission, negligence, forgery or bribery. The examination of the cause for responsibility of accepting illegal remuneration (extortion) in medical service is justified.

The last chapter of this section clearly and specifically presents the basic aspects for organization and implementation of legal-medical investigations on matters of professional service related legal transgressions by medical workers. The concluding (ninth) chapter of the textbook seems to be related to this chapter. It laconically illuminates questions of Soviet civil and criminal processes. Naturally, a significant place in it is given to the role and significance of the investigation, primarily legal-medical. The bases of appointing the investigating commission are examined, as well as the order of conducting the investigation, and the rights and responsibilities of the Soviet expert as an active participant in the criminal process.

The textbook is well written and is easily assimilated by medical students. Despite the varied topics illuminated in this text, the author has been able to achieve a unified approach in presenting the material.

Among the critical comments we may point out the following. In the chapter entitled "Responsibilities Arising as a Result of Doing Harm" (section four), in our opinion it is necessary to give a broader and more detailed description

of civil responsibility and the forms of compensation for damages caused by improper medical treatment.

For reasons which are unclear to us, the question of doctor-patient confidentiality is not included in the instructional program of the course on Soviet law. This is only mentioned in the text in the Physician's Oath of the Soviet Union. The same may be said also of the question of legal significance of medical documentation.

In illuminating the content of service-related and professional crimes by medical workers, a greater number of illustrative examples from specific life situations and so-called "physician's matters" could have been given. This would have had a positive effect on assimilation of the material by the students. It would have been desirable to have an index of works dealing with basic questions of Soviet law, and particularly with legal problems in medicine, at the end of the text.

The main advantage of the reviewed work is the fact that the textbook on Soviet law which has been prepared for the medical VUZes will be of help not only to students, but also to practicing workers in the public health system in raising the level of special medical-legal knowledge.

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PROTECTIVE BARRIERS AND HAZARD ZONES ESTABLISHED IN MAXIMUM-PROTECTION LABORATORIES

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 84 (manuscript received 2 Apr 84) pp 89-91

[Article by V. I. Votyakov, V. S. Bortkevich, A. G. Moroz and A. G. Pivchenko]

[Text] Organization of laboratory work with infectious material is intimately associated with raising the reliability of protective resources which would prevent escape of infectious materials into the surrounding environment. Such protection may be achieved in different ways [1,5].

Differences exist today in the interpretation and understanding of protective barriers and hazard zones. This generates confusion in implementing protective measures when organizing special laboratories for work with infectious materials. The objective of this paper is to clarify these concepts employing an example of organizing a protective system employing a protected production line set up in a specially equipped area.

Protected production lines taking the form of isolation rooms were used as an experimental model for determining the reliability of environmental protection. Different types of laboratory operations were carried out in the protected production lines. Reliability was calculated by probability methods given in books written by Likholetov (p 515, formula 9, § 167) [4] and Gnedenko (p 51) [3], with the necessary modifications.

We demonstrated earlier that protection of a laboratory's environment is achieved by a system for confining the infectious agent in a restricted space [2]. We used experimental data to calculate the probability that an infectious agent would get out into the space of a laboratory. We found that this probability is relatively low (once every 92 years).* Consequently in cases where even this negligible probability must be avoided, one other system for confining the infectious material is needed, one which would prevent escape of infectious material from the laboratory space into the surrounding environment.

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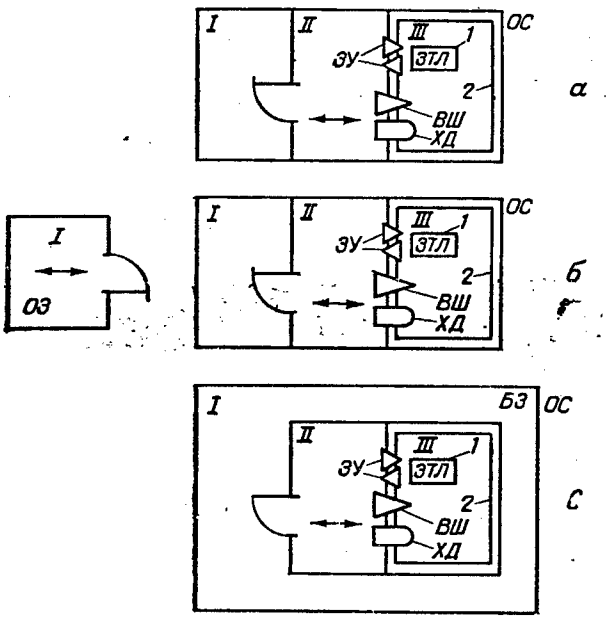
* The formulas used to calculate the reliability of the work of a protected production line are not published here.

We named the two successively organized systems for confining an infectious agent (one consisting of the confined spaces of the protective isolation rooms of the production line, and the other consisting of the confined space of the laboratory area within which the isolation rooms are located) correspondingly the first and second environmental protection barriers.

As we can see, in distinction from West et al. [5] we suggest applying the term barriers only to systems for confining infectious materials. To avoid inaccuracies we do not include as the first protective barrier the methods of individual protection of laboratory personnel based on the principle of repulsion or creation of obstacles. This is evident at least from the fact that even though laboratory personnel may be protected by overalls (the repulsion principle) or individual suits and gas masks (the obstacle principle), two barriers based on the confinement principle would also be needed to completely avert the probability that infectious materials would escape into the environment. What needs to be considered here is that when personnel work in individual suits, infectious material may escape into the laboratory area. As we can see, this raises the issue of organizing a second confinement barrier, which can be done by applying an architectural layout concept based on secondary confinement of infectious material in the space adjacent to the area in which work is carried out in overalls. This is achieved with two specially equipped compartments, one located inside the other (to form a double envelope).

In this communication we will examine the organization of two protective barriers, the first of which is represented by protected production lines or their complexes, the components of which are plant manufactured. This barrier may be called the instrument-isolation room barrier. The second protective barrier confines the infectious material within the space of the specially equipped area by means of confining elements built into the structural design of the area. Consequently it can be called the structural design barrier.

A differentiated approach to different areas in the laboratory--subdivision of all laboratory areas into functional zones--is important to the problem of achieving maximum protection of the environment. As was indicated earlier, protected lines (the first barrier) are set up in a specially equipped area, the walls and other components of which make up the second protective barrier (see Figure). We suggest calling this area zone III. In case of failure of the first protective barrier, it may be infected by infectious material, though with low probability. Therefore special attention must be focused on this zone. The next hazard zone in the laboratory is zone II. The areas within this zone are not only contiguous with the third zone, but they are also connected to it by three types of protected cubicles operating according to the confinement principle (the cubicles used to introduce materials into the protected production line and remove decontaminated wastes from the protected production line; cubicles for entry of personnel into zone III and exit of personnel from that zone after finishing their work with infectious materials). Zone II is a safe zone, and its safety is significantly greater than that of zone III, since the possibility that infectious material may escape into this zone is neutralized by the second confinement barrier. All areas located beyond the areas of zone II are treated as being in zone I. This zone is not



Basic diagram showing the arrangement of hazard zones in a maximum-protection laboratory designed with two protective barriers (variants *a*, *b*, *c* without regard for surface areas of zones *I*, *II* and *III*): ЭУ--protected cubicles used to introduce material into the protected production line (ЭТЛ) and remove decontaminated wastes from the ЭТЛ; ОС--environment beyond the building in which the laboratory is located; ВШ--air locks for movement of personnel (as indicated by arrows); ХД--chemical shower; БЗ--buffer zone; ОЗ--separately standing building in hazard zone *I*; *1*--first protective barrier taking the form of a protected production line; *2*--second protective barrier taking the form of a specially equipped area with impenetrable walls (double lines); *I*, *II*, *III*--functional hazard zones

only safe, but it also contains the so-called clean rooms of the laboratory in which all work not associated with infectious material is carried out. The areas of zone I may be contiguous with areas in zone II. In this case they communicate with each other by an ordinary door allowing passage of personnel out of zone II. Some of the areas in zone I may be contiguous with zone III, but only if impenetrable walls separate the two; in no way can there be direct functional communication with zone III. We call this part of zone I the buffer zone (see Figure *c*). Some of the rooms of zone I may be located some distance away from the main laboratory rooms (for example for cell culture production, for animal maintenance and so on). We refer to these as independent areas of zone I (see Figure *b*).

The subdivision of laboratory areas into the three zones we propose makes it possible to clearly distinguish the potential danger in different zones due to

possible development of accidental dissemination of infectious material, and to limit the movement of materials and people in the course of research. Other authors [5] divide the laboratory areas into two zones, which they arbitrarily label the working zone and control or access zone. The former is essentially zone III in our interpretation. The access zone is all of the rest of the areas, including the chemical shower together with the appropriate components permitting passage of personnel, which does not reflect subdivision of the areas all that clearly in terms of organizing maximum protection. In this case we consider the chemical shower to be not a separate zone but only one of the variants of a protective cubicle that confines infectious material.

In contrast to other researchers dealing with the problem of safeguarding work with disease agents of various nosological groups [5], in this paper we propose a more exact and uniform interpretation of the basic premises of environmental protection depending on the form of protective resources employed. First of all reliable protection is achieved by technical resources based only on the principle of confining the disease agent in a restricted space [2]. Second, in contrast to other researchers [5], we allow that the first protective barrier may be created not only by protective systems such as isolation rooms but also by a specially equipped area depending on the selected protection variant. Third, the areas of the special laboratory are divided into three functional work zones--III, II and I--depending on presence of infectious material in a specific place of work.

Conclusions

1. The concepts of protective barriers and functional hazard zones in maximum-protection laboratories working with infectious materials are defined more specifically.

2. The main prerequisite for maximum protection of the environment is presence of two barriers for confining infectious material.

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SECONDARY MEDICAL TRAINING REQUIRES REFORM

Moscow PRAVDA in Russian 30 Oct 84 p 3

[Article by Ukrainian SSR Academy of Sciences corresponding member Prof S. Lavrik, Medical Institute imeni A. A. Bogomolets, Kiev: "A Physician's Vocation"]

[Text] At the beginning of the school year, it is with special attention that one overhears the discussions of first-year medical students concerning their selected profession. Are they aware of the entire responsibility of their choice?

I recall one embarrassing incident which occurred when I was young, when I had just begun my practice as a physician. One of my patients stared at me with a look of mistrust and said: "Would there be an older physician around?" And on more than one occasion in the future I noticed that people tend to entrust their concerns about their health to more elderly physicians, who in their opinion are consequently wisened by experience. I do not wish to generate a conflict here, but the main hopes of modern public health are of course associated with the young.

In the Ukraine for example, just this year alone over 7,000 persons received diplomas from medical institutes. Scientific accomplishments such as microsurgery, endoscopic research methods, the use of lasers, hemosorption and the use of computers for diagnosis are elementary to them. But at the same time this new face of public health would be unimaginable without a humanitarian approach to the suffering, ailing individual. The concept of a physician's duty and the vocation and morality of the doctor are questions of greater importance today than ever before.

This is precisely why selection of healers and doctors must begin long before training in the institute. And the reform of schools of general education and professional schools is opening up new possibilities for this. It is permitting us to seek candidates who are not simply "predisposed" toward medicine and taken by the romanticism of the white coat, but persons who have come to understand the burdens of their future profession from practical experience. Then their selection itself becomes more accurate.

Last spring I had to speak with a student who submitted a request to be dropped from school. Before having completed a year of study, colliding with anatomy

and having attended the introductory course for his specialty, the young person came to understand that this work was not within his character. And he was not wet behind the ears. Seven years of work in production, service in the army and almost a year of study in a preparatory school were behind him.

Of course, this decision did not come easy to him. But it could also be that the physician's profession found itself short one efficient worker whose desk this student had occupied. Unfortunately this is not an isolated case.

We can obviously boldly treat work habits--a mandatory element of training, and professional orientation based on the real needs of society--in other words, the changes foreseen by the school reform--as a socioeconomic basis for the future. Life itself confirms that the best among middle-grade and junior medical workers recommended to institutions of higher education by therapeutic institutions produce the best--that is, the most competent physicians devoted to their work. This is now codified in the admission rules: Junior medical personnel are given certain advantages in competetive application if they had worked for not less than 2 years.

Medical school graduates also deserve more attention from the medical institutions of higher education than ever before. There is more to it than just the fact that they are accustomed to the hospital ward, the operating room, the obstetric ward and the polyclinic. The difficult decision to become a nurse, a laboratory assistant or a medical assistant does not come about by inspiration as a rule. On the other hand, training in medical schools does not provide adequate preparation in general education subjects: physics, chemistry, biology, Russian language and literature. Therefore medical school graduates who enter institutions of higher education are often unable to compete with individuals who graduated from schools of general education. The advantages granted in admitting secondary medical workers to institutions of higher education ignore gaps in knowledge and legalize them. Experience shows that the academic successfulness of most individuals who are admitted on a priviledged basis is low. I think that we need to raise the level of study of natural scientific disciplines and Russian language in the medical schools. Then the admission advantages would cease to be an indulgence.

Of course, these measures must not limit the possibilities for graduates of secondary schools of general education for entering higher medical schools. The main thing is to test out the sincerity of their desires and intentions in time. Both conscientious work by senior students in a medical work detachment and apprenticeship as junior medical personnel should promote this as well.

The institution of higher education can also do much to raise the teaching of fundamental disciplines in medical schools to the level it requires. Such attempts have already been undertaken. But the time has come to initiate a system of schools to serve as a base for each medical institute. The latter would then share the responsibility for the quality of theoretical training in these schools.

These efforts will be compensated a hundredfold. If together with schools and medical schools the institution of higher education might insure that persons

entering the former for specialization have received a sound education, then it might acquire reasons for reorganizing its own training plans, which would now be intended not for some "average" student but rather for young people capable of dealing with lectures and seminars of deeper content and with serious course assignments.

The school reform has increased the role of the work education of students. It is very important to continue this education in the VUZ as well. Participation of students in caring for patients and in regular evening and night duty at hospitals and first-aid stations has become a tradition in medical institutes. Our senior classmen eagerly help their older colleagues in influenza outbreaks, and work campaigns at construction projects of Sakhalin, Tyumen, Kazakhstan and other places have proven themselves well. Each year the students in all classes except the graduates help in the harvest in September.

However, while almost all forms of labor education of students have been made a regular thing and tied in with the duration and intensity of the training process, participation in autumn agricultural operations still continues to be something "unscheduled." Should we not think about changing the dates on which the training year begins and ends, so that the lesson cycle in secondary special educational institutions and institutions of higher education would correspond precisely with the requirements of the training plans and programs?

The reform in secondary education is not only a matter for educational organs. Training and indoctrination of the growing generations is the business of all departments, scientific institutions, VUZ collectives and public health. Medical institutes--and in particular ours, which contains public health and pediatric faculties and special departments--possess highly qualified personnel capable of participating in an investigation of the study and work schedule of the primary and secondary school, the hygienic conditions of study and the organization of sensible diet and rest. A simple action would get things going: The organs of people's education need to formulate a scientific order to science.

Of course, not all of the proposals suggested here are of equal value. However, the success of the reform depends not only on "strategic" decisions but also on small things. Our colleagues in education are entitled to rely on the support of VUZ instructors, scientists and students in both one and the other.

11004
CSO: 1840/096

PROBLEMS WITH PLACEMENT OF GRADUATING PHYSICIANS

Moscow MEDITSINSKAYA GAZETA in Russian 10 Oct 84 p 2

[Article by A. Gadasina, special correspondent of MEDITSINSKAYA GAZETA, Moscow: "Specialist Shortfall"]

[Text] This year, medical VUZ's and faculties of universities in the Russian Federation graduated 25,000 phsyciains. Most of them are already working, have met their colleagues and have seen their first patients. But not all of them....

We met with D., a [female] graduate of Blagoveshchensk Medical Institute, in the Administration for Personnel of the RSFSR Ministry of Health. What brought her to Moscow? The wrong assignment. In contradiction to the state pertaining to young specialists, the institute placed D. at the disposal of the Sverdlovsk Oblast Health Department, even though her husband graduated from a tekhnikum last year and is working in Amur Oblast. The physician's request was granted at the ministry. She will do her internship and work where her husband is living.

Another visitor: K., a graduate of Kalinin Medical Institute, is asking that he be allowed to stay in his home town. He has a legitimate reason: his father is at home, and he has a group I disability. The original assignment for this young man was changed.

However, all of these questions could have been settled locally, if the paperwork for assignment of young specialists had been properly prepared and contained all the necessary information about family status.

This year, the ministry approved 70 requests for reassignment of graduates of the Perm Medical Institute. There were many changes made at the Saratov, Astrakhan and Voronezh VUZ's.

Both graduates and public health agencies, which ultimately fail to get the specialist they need suffer because of the inadequate work of state commissions for assignment and dean's offices.

As a rule, young physicians settle in the place where they were trained, so that the personnel problem is more complex in areas where there are no medical VUZ's. This problem is being solved well in Kirov, which our newspaper has already reported.

There, secondary school graduates--attendants, nurses and feldshers--are assigned to VUZ's in the vicinity. The oblast health department then carefully observes the progress of these students, it is informed about their work at school and interests and, the year of their graduation, submits requests to the dean's office for expressly these students. The future physician already knows what job he will get and where he will live. This is quite important for someone starting out on his own. Bearing this in mind, a 120-unit apartment house with all amenities was constructed in Kirov for young specialists.

There has been concern about young people in Tambov and Omsk, where 360-place dormitories have been built in Saransk and other cities. But this is not how things are everywhere by far.

The couple, M. (he is a pediatric surgeon and she is a pediatrician) arrived in the capital from Tula, with their two small children. They were unlucky with regard to assignment: the specialists were sent to different institutions and provided for separate housing for the husband and for the wife and children. For this reason, the couple is requesting reassignment. A phone call is made from the Administration to the Tatar Ministry of Health. It is known that the housing situation in that republic is not bad. "Such specialists are needed in Brezhnev," is the answer from Kazan, "have them come here, we shall provide an apartment."

Each year before assignments are made, the RSFSR Ministry of Health mails out inquiries and, in particular, asks about the housing situation. But the data of oblast health departments are not always truthful, sometimes they refer to what they would wish for rather than what they really have. The results are unambiguous. According to data of the Personnel Administration, due to lack of housing, this year alone 165 physicians left Kemerovo Oblast, 119 left Stavropol Kray and 110 left the Maritime Kray. The situation is not much better in Orel, Novosibirsk and Perm oblasts, Khabarovsk Kray and the Bashkir Autonomous Republic. In Sverdlovsk Oblast, the housing situation is such that there are as many specialists sent there by the ministry as there are who leave. Obviously, there is a shortage of physicians in these places.

Other figures were also cited at the Administration for Personnel: in 1 year, only one person left Yaroslavl Oblast and one left Kalinin Oblast due to lack of housing.

But there are also other reasons for the dissatisfaction of young physicians with their situation, the desire to change their assigned location. Specialists do not stay long in areas where the material and technical base is poor, where there are no opportunities for professional growth and there is formal organization of instruction.

But what is to be done with those who were assigned to a progressive institution, provided with housing but still wanted to make a change, trying to find any excuse not to travel to the assigned place?

The story of A. V. Zmiyev, a graduate of Kalinin Medical Institute, is demonstrative. He was sent to the Red Banner Rayon Hospital in Kaliningrad Oblast, but he never started working there.

For a long time, the efforts of the oblast health department to find this young specialist were fruitless. Finally, by chance, it was learned that the physician had married, took the surname of his wife, and got a job under the name of Shevaldov. In response to a letter from the oblast health department, the Shevaldov-Zmiyev was relieved of his job, but he never did go to his assigned location. His wife, V. V. Shevaldova, also declined her assigned job. The two physicians never responded to the requests of the oblast health department to come to its offices. Again a search began for the missing specialists. It was learned that they found jobs in sanatoriums, where they were hired in contradiction to the Statute for Young Specialists.

Missing specialists is a constant sore point in the large job being done in the area of personnel assignment by the ministry and local health agencies. No matter how much is being written and said on this subject, the situation has not changed!

Efforts are made in each medical VUZ to inculcate in students a sense of duty and love for their profession. It is not by chance that, after leaving an educational institutions, physicians, like servicemen, take the Oath of Physician of the Soviet Union. However, this is where the analogy stops. The physician remains unpunished after abandoning the "battlefield."

I was shown two diplomas at the Administration for Personnel, which have been lying there for more than a year. One of them belongs to A. G. Erk, a graduate of the Moscow Medical Institute and the other, to A. I. Ovsyannikov, who graduated from Smolensk Medical Institute. At different times, both had insisted on a reassignment without sufficient grounds. The ministry refused them. Then the young physicians, flinging their diplomas on the table, left and never appeared again.

This means that the secrets of their profession were revealed to them in vain and the state had spent in vain thousands of rubles to provide medical training for casual people.

How are institutes to avoid defective work? People are not items, the quality of which can be tested in departments of technical control. Sometimes the graduates themselves realize that they made a mistake after graduating from a VUZ and spending their first months in independent work.

Apparently, there should be better definition of criteria for applicants to medical VUZ's, the system of professional screening should be improved, with consideration of the distinctions of the practice of medicine, in order to reduce the number of lost specialists, rash and hasty "marriages," the purpose of which is to spare the "bride" the necessity of going to an assignment. And also, to avoid a repetition of the incident that recently occurred in the ministry, when a young specialist who learned that marriage does not entitle her to refuse to take an assignment, angrily exclaimed: "If I had known this, I would have married someone else!"

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PRICE OF EMPTY PROMISES

Moscow MEDITSINSKAYA GAZETA in Russian 19 Oct 84 p 2

[Article by Y. Klebanov, head state sanitary physician of Kazakh SSR, Alma Ata, "Price of Empty Promises"]

[Text] The start up of a new shop in the copper works of the Irtysh polymetallic combine has worried sanitary physicians for a long time. During its construction, the operators gave a lot of attention to the operation of electric furnaces, while the problem of purifying waste products let off into the atmosphere come up rarely and in passing, at various meetings.

After the shop was opened, it turned out that many thousands of cubic meters of gas were being released, unimpeded, into the atmosphere. Ten fines imposed on the combine managers and letters to the Ministry of Non-Ferrous Metallurgy of this republic inspired no results, but all sorts of promises that measures would be undertaken, if it was only to be decreased. Sanitary service adopted a resolution prohibiting operation of the shop. Only after this did manufacturers take the necessary measures. In 2 weeks, the electric filters began to operate.

So, was the developing situation "programmed"? Of course not. The obsolete psychological approach to solving important problems was known. Today, manufacturers are required not only to put out high-quality production, but while doing this to also protect nature and people's health. But it is necessary to state that profound resolutions aimed at the future have not yet become a guiding line in the work of some manufacturers.

The law concerning protection of the air is especially significant for our republic. It has joined the number of foremost republics in intensity of industrial development. Kazakhstan occupies one of the leading places in production of non-ferrous and ferrous metals, petroleum output, mineral fertilizers and coal. Industrial-territorial complexes have sprung up and are successfully developing: Pavlodaro-Ekibastuzsk, Mangyshlak, Karaganda-Temirtau and others. Even new enterprises are being constructed in our cities. And problems of saving the purity of the air and protecting our people's health are becoming more urgent.

This republic has accepted several important documents aimed at improving the environment. The Ministry of Health, along with interested ministries and departments, has worked out complex projects of specific measures for preserving the air. They have been examined by the Gosplan of this republic and considered in projects. This positively provided good results.

In recent years, 798 installations for purifying industrial air pollution have been built or reconstructed in Kazakhstan. From year to year, capital investments into preservation of the environment and efficient utilization of natural resources increase.

The intensification of sanitary propaganda among the population also helps in this matter. The radio-television programs "Horizon", "Wide Open Window" and "Nature" are widely used for this. There are 95 national "Nature" universities in operation, the output of informational and scientific-popular literature has been increased and lectures are given everywhere. This has made it possible to raise the level of the population's ecological education.

The complex approach to solving problems, I shall repeat, has brought positive changes. And still, far from everywhere is the preservation of our air treated seriously, with complete responsibility. There are many examples of this.

In the city of Dzhanbul, there are plants of the All-Union Association of Phosphorus Industry of the Ministry of Mineral Fertilizer Production of the USSR. Purification installations operate poorly there. Technological schemes of purifying gases, developed by the planning institutes "LenNIIgiprokhim" and Kazakh NII "Giprofosfor" (Chimkent), have turned out to be ineffective. Moreover, they also are operated poorly and are often out of operation.

The same scenario can be found at plants of this ministry which are located in other areas of this republic. Sanitary service is constantly sounding the alarm about infractions of the law to protect the air, fining managers of the enterprises and turning to the district attorney. However, they have not been able to accomplish anything so far but receive promises to correct the situation.

Similar demands have been made repeatedly to the USSR Ministry of Mineral Fertilizer Production. But there, taking refuge in the pressing necessity for output of production for agriculture, they ignore all instructions of sanitary physicians on environmental protection.

At enterprises of the Kazakh SSR Ministry of Non-Ferrour Metallurgy, the discharge of harmful substances into the atmosphere and reservoirs has been reduced somewhat, but there are still many which pollute the air in the cities of Ust'-Kamenogorsk, Leninogorsk, Chimkent and several others.

Industrial projects costing more than 7 million rubles have been constructed at the Ust'-Kamenogorsk lead-zinc combine for utilization of sulfur-containing agglomeration gases of lead derivation. But during operation of the

complex, complete ineffectiveness of these installations and the technological scheme were revealed.

Sanitary service has a powerful lever: the sanction to suspend operation of an enterprise which is polluting the environment. But we, exercising this right, do not act from a narrow departmental position. What does it mean to close a large plant and prohibit manufacture of production? The enterprise will stand, bringing losses. We understand this well. But on the other hand, we cannot bring harm to nature and forget about people's health.

Apparently, it is necessary to bring managers of such enterprises under stricter juridical responsibility for breaking the law. And the district attorney's word must carry more weight. And then at times it turns out that our decision on a closing is upheld, but the enterprise continues to operate and pollute the environment.

I would like to say something extra about the design institutes. There is direct evidence of low-quality production of "VNIPIenergoprom", "Sredazgiprosel'stroyindustriya", Okhtinsk NPO "Plastpolimer", USSR Ministry of Chemical Industry "TsITETsel'khoz," USSR Ministry of Agriculture and several other republic institutes. Obsolete dust-gas purification systems are included in projects and specialists do not think about introducing low-waste and waste-free technology and utilizing waste products.

A law to preserve the air is necessary for everyone. It is time this truth were adopted by those who love to give all the possible promises, which are not followed by definite actions.

12473
CSO: 1840/1571

BRIEFS

NEW SANATORIUM-DISPENSARY POSITIONS--L. Kozlova of Kostroma writes: "I read in TRUD that a decision has been made to introduce new positions into the staff of sanatorium-dispensaries--educators and pediatricians. Please tell me about this in greater detail." AUCCTU Deputy Director of the State Social Insurance Department A. Samokhvalov replies: "The order of organizing and staffing additional mother-and-child shifts in trade union sanatorium-dispensaries was determined by a joint letter of the AUCCTU and the USSR Ministry of Health. The need for organizing one or two shifts for recuperation of mothers with children during summer vacation is determined by trade union councils and committees jointly with business managers of enterprises possessing sanatorium-dispensaries and with the appropriate public health organs. These shifts are organized for recuperation of working mothers needing preventive treatment together with weak children from three to fourteen years old. Working mothers are subjected to medical selection for admission to sanatorium-dispensaries by physicians of enterprise medical-public health units or by the appropriate rayon (city) polyclinic. Children are selected by the sanatorium-resort selection commission of the children's rayon (city) polyclinic. Pediatricians are selected and sent for work in sanatorium-dispensaries for the period of such shifts by public health organs. These physicians, who are sent with their consent for 1 or 2 months of work to such sanatorium-dispensaries, are permitted to retain the same wages they were receiving in their principal position. Educators for work with children are added to the staff of sanatorium-dispensaries for the period of these shifts in accordance with standards set by the AUCCTU. Workers are selected by enterprise trade union committees and business managers." [Text] [Moscow TRUD in Russian 27 Oct 84 p 4] 11004

HYGIENIST CONFERENCE--Vilnius, 29 Oct (EL'TA)--The Eighteenth All-Union Congress of Hygienists and Public Health Physicians was convened here today. Executives of public health ministries, scientists and representatives of public health services of fraternal republics gathered together in order to discuss the results of scientific and practical activity and to plan out the goals of subsequent preventive work in light of the tasks posed by the party; the guest list included representatives from Czechoslovakia, Cuba, Poland, Mongolia, Hungary and the GDR. The congress participants were welcomed by Deputy Chairman of the Lithuanian SSR Council of Ministers A. Yu. Chesnavichus. Cuba's Deputy Minister of Health E. Terri [transliteration] presented a welcoming address in behalf of guests from socialist countries. USSR minister of health, USSR chief state public health physician, Academician P. N. Burgasov gave a report on the present tasks of hygienic science and the experience of protecting and reinforcing the health of the country's population.

The achievements and the prospects for further development of hygiene were illuminated by USSR Academy of Medical Sciences Corresponding Member N. F. Izmerov, director of the USSR Academy of Medical Sciences Institute of Labor Hygiene and Occupational Diseases. Academician G. N. Serdyukovskaya, chairman of the all-union problem commission "Scientific Principles of the Hygiene of Children and Adolescents," provided a survey of the problems of hygiene in light of the reform of schools of general education and professional schools. Lithuanian SSR Deputy Minister of Health A. A. Vinkus, the republic's chief state public health physician, gave a report on the tasks of the epidemiological service and of the Lithuanian Republic Scientific Society of Hygienists in light of party and government decisions. Participants of the congress proceedings include Deputy Director of the Culture Department of the USSR Council of Ministers D. A. Basalyk, Director of the Department of Science and Academic Institutions of the Lithuanian Communist Party Central Committee V. S. Baltrunas, Lithuanian SSR Minister of Public Health I. I. Platukis, and other important party and soviet workers. The All-Union congress of hygienists and public health physicians will conduct its business for 3 days. [Text] [Vilnius SOVETSKAYA LITVA in Russian 30 Oct 84 p 3] 11004

PROFESSOR SCORES OVERBEARING FORMALITY--Grodno--I read the article "In a Winning Position" published on 15 July and I would like to continue this conversation about the directive tone. It has somehow become a normal thing for us that announcements about measures that have been implemented very often end with the words "attendance compulsory," and sometimes the word "strictly" is also added. This is why at some polyclinics they think that a patient being treated as an outpatient is not invited to visit the physican but is "called for." As if he had committed some offense. Party workers are also sometimes guilty of the "directive" word. I remember that they telephoned me from the city party committee and said that I was to report to the gorkom secretary at 1700 hours. I asked why. The answer: "Come here and you will find out." When I arrived a secretary greeted me very warmly and thanked me for a letter in which I had made some suggestions about a matter that was being discussed at that time. Individual associates (unfortunately including party workers) think that when dealing with visitors they must conduct themselves on a strictly official level, that a kindly and friendly tone is unsuitable. An incorrect opinion! [Letter to the editor from V. Brzheskiy] [Text] [Moscow PRAVDA in Russian 14 Sep 84 p 3] 9642

CSO: 1840/015

NEUTRALIZING INFECTION--Scientists from the Leningrad Scientific Research Institute of Epidemiology and Microbiology imeni Pasteur and their colleagues from the Virus Department of the National Health Institute, Finland, are conducting parallel trials of interferon for the purpose of increasing the activity of this pharmaceutical agent. As reported by LENTASS, specific reaction methods were discussed during the visit to our city of well-known Finnish virologist K. Kantell, who has been able to organize mass production of the most active interferon in the world. The discovery of this protein substance, capable of resisting many viruses, has been acknowledged as one of the major achievements of this century in medicine and biology. As is well known, in defending itself from infection, the body manufactures highly effective protective antibodies. However, they do not begin to enter the blood until several days after infection, whereas interferon is formed by the cells even in the first hours after "intrusion" of the viruses, neutralizing them and helping the body fight the disease. The use of donor interferon has had positive results in the treatment of various illnesses, and this agent is currently being produced in many countries, including the Soviet Union. "Several years ago, specialists from our institute visited our Finnish colleagues," relates Professor A. A. Smorodintsev, laboratory director of the Leningrad Institute and doctor of medical sciences. "We exchanged results of research and acquainted ourselves with details of the technology of interferon synthesis in Kantell's laboratory. His visit to Leningrad is the continuation of bilateral collaboration. The Finnish scientist gave our work a high evaluation and lectured to specialists concerning the current status of interferon synthesis and its use in medical practice in Finland and other countries. In accordance with intended plans, we will send our compounds to Kantell's laboratory, for determination of their biological activity and tests of therapeutic agents under clinical conditions. In turn, our institute is carrying out a similar study of new compounds obtained in Finland, which will unconditionally serve as a mutual increase in the effectiveness of studies performed. [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 17 Oct 84 p 2] 12262

HEALTH SERVICE PROBLEMS--"Health--the Public Wealth". An article under this headline was published in the seventh issue of the NK [expansion unknown] page of SOVETSKAYA ESTONIYA. It concerned shortcomings in the medical service of workers in industrial enterprises. The editors have received a response to this material from ESSR Minister of Health V. Ryatsep and Tallinn Gorispolkom Deputy Chairman [illegible]hin. They report that the article was discussed at the health department Ispolkom of the Tallinn Municipal Council of People's Deputies ispolkom together with the administration city hospitals. Attention was given to the need to improve analysis of production accidents in the Il'marine and construction ceramics plants. By order of the ESSR Ministry of Health, local health organizations in cities and rayons of the republic were entrusted with making up first aid kits at workplaces and health centers and measures for putting them together were taken. The attention of health center medical workers was drawn to the need for detailed identification of the causes of production accidents. Lecture series are being organized under the auspices of the Experimental and Clinical Medicine Institute to improve the skills of shop physicians. Actually, the area of facilities for polyclinics in the republic is significantly below the norm. At the present time a medical hygiene section [medsanchast'] is under construction at the Slantsekhim Production Association. Construction of a polyclinic in Tartu is being planned as well as an addition to the municipal polyclinic building in Narva. The Narva SND [construction documentation norm] Gorispolkom adopted a resolution concerning construction of hotel-style living quarters in 80 apartments and concerning the allocation by city enterprises of living quarters for medical workers. [Text] [Tallinn SOVETSKAYA ESTONIYA in Russian 18 Oct 84 p 2] 12262

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EXPERIENCE IN CENTRALIZED SUPPORT OF INDIVIDUAL DOSIMETRIC MONITORING

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 84 (manuscript received 8 May 84) pp 63-64

[Article by A. V. Yepishin, V. I. Busov and V. I. Kulagin]

[Text] The idea of centralized dosimetric monitoring has been recognized among scientists and practical workers dealing with the problems of insuring and monitoring radiation safety. This is understandable, inasmuch as up until now, the resources to evaluate the main criterion of the status of radiation safety and the individual irradiation doses of personnel and the data obtained in this fashion belong to a large number of monitored facilities. Under these conditions it is extremely difficult to insure objectivity of the obtained data or to standardize the monitoring methods. The following grounds exist for centralizing individual dosimetric monitoring: a scarcity of the most effective measuring resources, particularly those of thermoluminescent dosimetry, and the justified desire to concentrate them in large central laboratories; the problematic nature of complying with all of the subtleties in the technology of the widespread photodosimetric method when it is used by laboratories of isolated facilities.

Thus no one can doubt the need for centralizing individual dosimetric monitoring. The problem is how this important measure should be implemented.

As far as we know, two or three central individual dosimetric laboratories for the republic's enterprises and institutions are to be created at large scientific centers. It would doubtlessly be easier to supply such laboratories with scarce, expensive and the most effective dosimetric apparatus, and their data on individual doses would have a scientifically grounded nature. But there is the apprehension that with such a system the obtained data would no longer be current, and serious difficulties would be created in delivering dosimeters to clients and returning them after exposure and reading.

These shortcomings are absent from a method of centralized individual dosimetric monitoring adopted in Gorkiy Oblast, where individual dosimetric monitoring has been conducted since 1977 by the manpower and resources of an individual dosimetric laboratory. The laboratory staff consists of three persons (two laboratory technicians and an engineer). Using the photomonitoring method, this laboratory staff is capable of determining up to 1,500 individual doses each month.

By prescription of the oblast SANEPID station, each year all of the city's and oblast's enterprises sign agreements for individual dosimetric monitoring of their personnel.

The list of establishments serviced by the laboratory includes industrial enterprises, construction and installation organizations, scientific research institutes, institutions of higher education and medical institutions (including personnel of X-ray offices).

As was noted earlier, the laboratory has adopted the photodosimetric monitoring method, inasmuch as it permits registration of exposure doses of X-rays and γ-rays from 10 mR to 2 R at intensities from 20 kev to 3 Mev; in this case the error does not exceed 30 percent. The method is universal, it is sufficiently easy to carry out, and the equipment is series-produced.

Practical use of this method was coordinated with the Leningrad Scientific Research Institute of Radiation Hygiene, and the laboratory's work was evaluated by the All-Union Symposium on Individual Dosimetric Monitoring in Riga, by the Department of Radiation Hygiene of the USSR Ministry of Public Health, and the State Committee for Standards.

The activity of the laboratory is organized in such a way that whenever the exposure dose recorded on film is over 200 mR, the oblast SANEPID station is immediately informed, even before the enterprise at which such an exposure occurred. After it is developed, the dosimetric film is stored as a document for 2 months, and the detector that received the excessive dose is stored for up to 1 year.

The oblast SANEPID station provides organizational and methodological supervision to the laboratory's activity, it determines the categories of persons subject to monitoring with dosimeters, and it analyzes the measurement results. Each year the laboratory submits a report on its work to the oblast SANEPID station.

An analysis of the results of over 20,000 dosimetric measurements made by the laboratory made it possible to derive the radiation loads on individual occupational groups coming in contact with sources of ionizing radiation, and then to develop oblast and facility working control levels of radiation safety.

There can be no doubt that central laboratories such as the one organized in Gorkiy Oblast make it possible to standardize the methods of dosimetric monitoring, create the conditions for growth in the reliability and objectivity of measurements, and provide state public health inspection organs with current material with which to evaluate radiation safety at monitored facilities. Such laboratories must be created, and assistance should be provided in strengthening their material-technical base. Under these conditions large laboratories situated at scientific research centers would be able to assume the job of selective monitoring in order to determine what the radiation loads are and to arrive at conclusions concerning such loads at the republic's facilities in general. At the same time they could serve as centers of methodological supervision of the activities of oblast central individual dosimetric laboratories.

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RADIOSENSITIVITY OF ANIMALS IRRADIATED IN MODIFIED GAS MEDIUM: MODIFICATION OF CEREBRAL SYNDROME IN MICE BY HYPOXIC HYPOXIA AND HYPEROXIA DURING IRRADIATION

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[Article by I. B. Ushakov and M. M. Abramov]

[Text] The effect of breathing pure normobaric oxygen on the radiosensitivity of hemopoietic tissue and the small intestine was studied in [1,2]. We were interested in evaluating the possible modifying action of hyperoxia and hypoxic gas mixtures (HGM) on the course of the cerebral syndrome. Published data on this question are few and contradictory. Thus the authors of [3], who studied rabbits that succumbed to radiation, diagnosed a higher oxygen demand in the irradiated animals and recommended the use of oxygen therapy in X-ray treatment of head tumors. Irradiation of the heads of mice with 8 mev electrons in doses greater than 350 Gr produced what the authors believe to be a paradoxical result: Pure normobaric oxygen had a protective effect, as is true for anoxia, though the effect was significantly less pronounced [4]. Presence of an "oxygen effect" (aggravation by oxygen and protection by HGM) was demonstrated with radiation doses of 0.052-0.258 Kl [expansion unknown]/kg [5] and 47-123 Gr [6]. In the latter case, however, the modifying effect was absent with radiation doses of 123-213.8 Gr. Absence of an aggravating effect by oxygen (at 1 and 4 atm) was also not revealed [7] on the basis of accumulation of glycogen in brain tissue 24 hours after irradiation of the heads of immature rats at a dose of 0.774 Kl/kg.

This paper evaluates possible modification of the cerebral syndrome in mice by a modified gas medium during γ-irradiation of the head and torso.

Materials and Methods

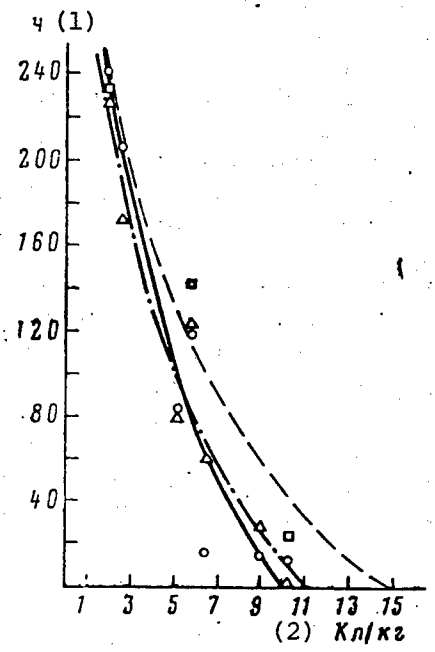
The experiments were conducted on 340 mongrel male white mice weighing 20-24 gm. The animals were irradiated by γ-quanta of ^{60}Co in 1.94-10.32 Kl/kg doses applied to the head or 2.58-12.90 Kl/kg doses applied to the torso at a dose rate of 1.73 mA/kg on the midline. The animals were irradiated in special partially sealed organic glass boxes that practically excluded movement of the animals relative to the irradiation source and the screen (the edges of a collimator). The weight of the front part of the animal (head) was 25-30 percent of the weight of the entire body, while the weight of the back portion

(the torso) was 70-75 percent correspondingly. The gas medium was modified during irradiation by blowing the appropriate gas mixture (HGM-8, air, pure normobaric oxygen) at a rate of 2.5 liters/min. The composition of the gas medium in the experimental chamber was constantly monitored using an Oxytest gas analyzer (the Netherlands). Moreover samples from the mixer and chamber were periodically analyzed for oxygen and carbon dioxide using a VTI-2 gas analyzer.

The expressiveness of the cerebral syndrome was evaluated from the mean life span (MLS), the time of appearance of individual neurological symptoms (tremor of the limbs, convulsions, hyperkinesia, ataxia, astasia, lying on the side and so on), and loss of body weight by the moment of death. Quantitative results were treated using regression, correlation and probit analysis as well as by comparing processes (regression series) using algorithms [8].

Results and Discussion

Quantitative data on death of the animals in the first 2 days treated by the probit method revealed that there were no significance differences between mice irradiated in air and in oxygen: The regression lines are parallel, and differences in all indicators of probit analysis are insignificant. Analysis of MLS in relation to irradiation by different doses provided a more-graphical and accurate impression of the significance of a modified gas environment to animal survival (see figure).



Dependence of mean life span of mice on dose when the head is irradiated in the presence of a normal and a modified gas medium: *1*--air, *2*--HGM-8, *3*--oxygen. Abscissa--dose, Kl/kg; ordinate--mean life span, hr

Key:
1. hr
2. Kl/kg

When the head is irradiated, the dependencies of MLS on dose are described satisfactorily by logarithmic equations. In this case the following differences are significant ($p<0.05$): $MLS_o<MLS_a$ for 1.94, 2.58 and 10.32 Kl/kg; $MLS_h>MLS_a$ and MLS_o for 5.81 Kl/kg; $MLS_h>MLS_a>MLS_o$ for 10.32 Kl/kg (a,o,h--subscripts indicating the gas medium in which the animals were irradiated: air, oxygen, HGM). Thus the MLS curves diverge as dose increases. The obtained effect is possibly explained by gradual increase in the contribution made to the overall syndrome by disorders of the central nervous system [9] which, as we know, is extremely sensitive to changes in the body's oxygen supply.

When the torso is irradiated, a somewhat different pattern is observed. The experimental points are approximated satisfactorily by linear equations. In this case $MLS_h<MLS_a$ for 3.87 and 9.03 Kl/kg; $MLS_h<MLS_o$ for 9.03 Kl/kg; $MLS_o<MLS_a$ for 9.03 and 10.32 Kl/kg. The dependencies of reduction of the body weight of mice by the moment of their death on irradiation dose hardly differed from one another, which indicates the absence of modifying action by the altered gas medium in relation to this criterion. The effects of modification of the affliction resulting from irradiation of the head in a modified gas medium can be clearly seen in relation to individual neurological symptoms. Aggravation of the effect during irradiation in oxygen and weakening of the effect when HGM-8 is breathed during irradiation are observed in relation to practically all indicators. This is readily evident when we extrapolate the curves to the abscissa. The doses obtained in relation to each symptom are lower than those observed in relation to irradiation in oxygen (see table).

Divergence of the curves describing the dependence of the time of appearance of symptoms (t) on dose in relation to irradiation of the head is noted approximately beginning with a dose of 5 Kl/kg; beginning with this dose, a tendency toward aggravation of the action of oxygen is noted. Thus while at a dose of 2.58 Kl/kg $t_o>t_a$ ($p<0.05$), at doses of 9.03 and 10.32 Kl/kg the reverse phenomenon is observed--$t_o<t_a$ ($p<0.05$). At doses of 5.81 and 10.32 Kl/kg, $t_h>t_a$ and t_o. Irradiation of the torso leads to the following changes: $t_o>t_h$ (3.87 Kl/kg), $t_o>t_a$ and t_h (9.03 Kl/kg), $t_o>t_a$ (10.32 Kl/kg). From these positions the early neurological symptoms accompanying irradiation of the head may be referred to as oxyphilic, and oxyphobic in relation to irradiation of the torso.

Summarizing all the data, we can conclude that modification of the radiobiological effect in an altered gas medium differs somewhat in relation to irradiation of the head and irradiation of the torso. This may be evidence of some limitations upon the use of the MLS criterion in relation to irradiating the torso with high doses. In other words the cause may have to do with different radiation syndromes being subjected to modification: the cerebral syndrome in relation to irradiation of the head, and a more complex pattern in relation to irradiation of the torso--the intestinal syndrome plus acute radiation injury of the spinal cord. Apparently this circumstance can also provide an explanation to some results in [6] that may seem paradoxical at first glance: absence of aggravation by oxygen and reduction of injury by hypoxia at irradiation doses of 47.0 and 213.8 Gr, at the same time that the oxygen effect does not manifest itself at larger doses. The general irradiation that was employed, which is essentially the sum of irradiation of the head and the torso, may have cancelled out different effects that modified the action of radiation

Functional Dependence of the Time of Appearance of Individual Neurological Symptoms (t) in Mice on Head Irradiation Dose in a Modified Gas Medium

(1) Неврологические симптомы	(2) Уравнение регрессии		(5) $D_{t=0}$, Кл/кг	
	(3) воздух	(4) кислород	(3) воздух	(4) кислород
(6) Тремор конечностей	$t=7,51-7,81 \lg D$ $r=-0,975$	$t=9,03-10,49 \lg D$ $r=-0,989$	9,154	7,258
(7) Судороги	$t=3,90-3,52 \lg D$ $r=-0,660$	$t=6,58-6,64 \lg D$ $r=-0,690$	12,822	9,790
(8) Двигательные припадки	$t=3,84-3,41 \lg D$ $r=-0,956$	$t=6,67-6,84 \lg D$ $r=-0,895$	13,369	9,444
(9) Атаксия	$t=6,76-7,21 \lg D$ $r=-0,962$	$t=9,12-10,74 \lg D$ $r=-0,983$	8,661	7,066
(10) Астазия	$t=4,70-4,61 \lg D$ $r=-0,901$	$t=6,60-6,88 \lg D$ $r=-0,887$	10,460	9,105
(11) Боковое положение	$t=4,49-4,13 \lg D$ $r=-0,930$	$t=6,37-6,24 \lg D$ $r=-0,882$	12,223	10,491

Note: $D_t=0$--dose obtained by extrapolation at which the time of appearance of symptoms is equal to 0.

Key:

1. Neurological symptoms
2. Regression equation
3. Air
4. Oxygen
5. Kl/kg
6. Tremor of limbs
7. Convulsions
8. Motor seizures
9. Ataxia
10. Astasia
11. Lying on the side

in a modified gas medium. It should be noted that the adaptation hypothesis offers promise as a means of possible interpretation and further study of the modifying effects of a modified gas medium on radiation injury of the central nervous system [10]. The first of four suggested parameters of the oxygen effect--oxygen tension--is known to increase by a factor of 2-2.5 in tissue--in the cortex and subcortex of rodents in this case, and on the other hand to decrease by a factor of 2-2.5 when HGM-8 is breathed [11]. Our experiments demonstrated that even when such pronounced changes in tissue oxygen tension occur, modification of the cerebral syndrome is relatively mild, though it is readily evident in relation to most of the doses applied to the head.

Together with data in [4-6] the obtained results confirmed that the approach reflected in [12], in which the combined action of hypoxia and irradiation upon nervous tissue is viewed as a simple mutually aggravating effect, is an unfounded simplification of the complex interaction between these two factors. The specific relieving effect of HGM-8 in relation to irradiation of the heads of mice is yet another example of the universality of the oxygen effect, demonstrated with many other tissues and systemic levels of the body [13]. The aggravating effect of hyperoxia during irradiation of the head is also

evidence of this. In general the result of the combined interaction of these factors would depend on the magnitude (range of doses, degree of hyperoxia), time and succession of their influence as well as on the degree of nonuniformity of irradiation. The theoretical aspects of this problem are illuminated in detail in [14].

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